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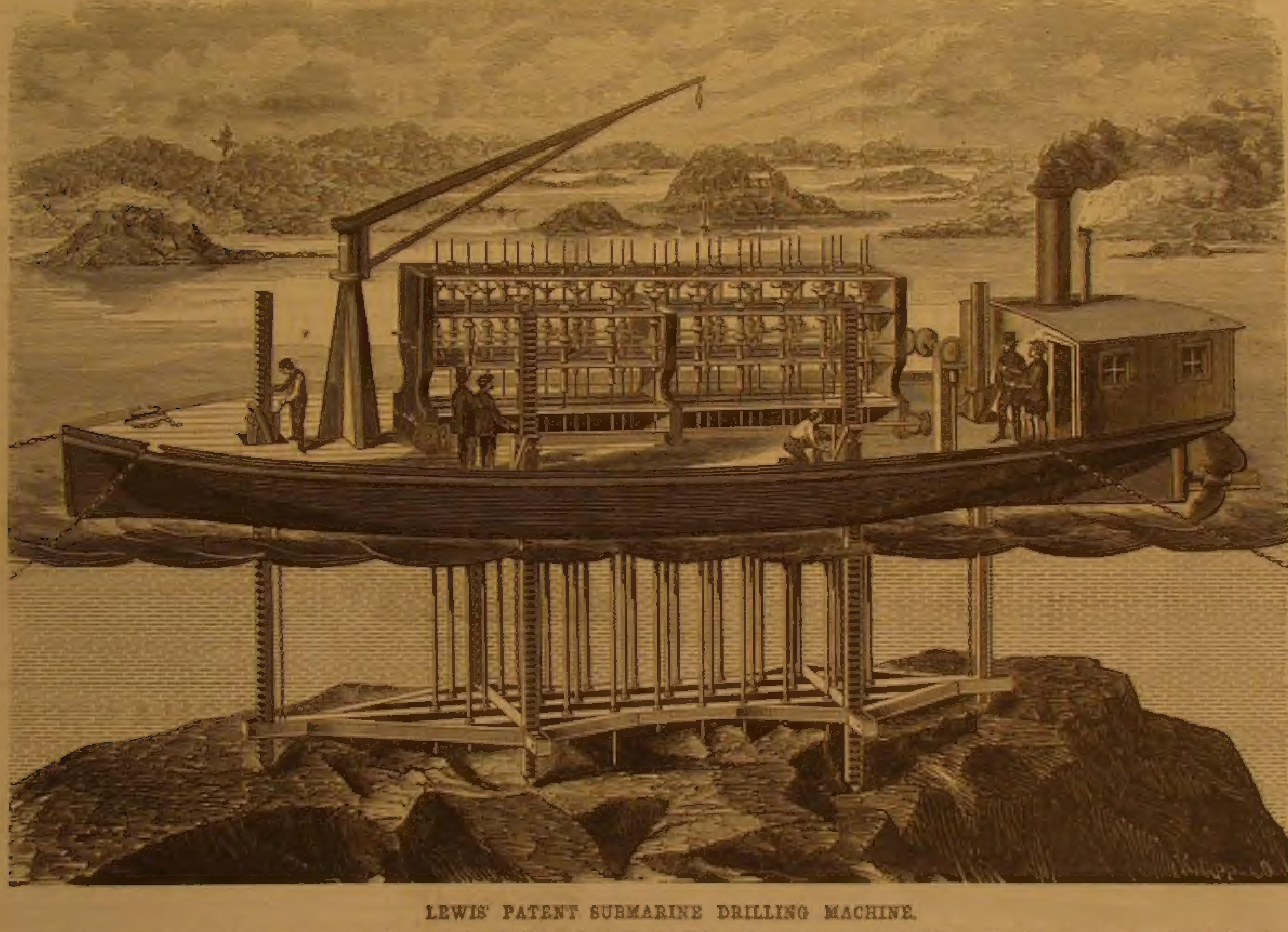
Apparatus for Removing the Obstructions from the Channel at Hell Gate.

The breaking up and removal from the channel at Hell Gate of the rocks which have been the cause of so much disaster, has engaged the attention of engineers for a long period, but has hitherto baffled all efforts. The obstructions still remain, a dread to mariners and a defiance to engineering skill. We illustrate and describe in this article an important attempt to solve the problem by the construction of an apparatus that shall work, unaffected by the violent action of the tides at that point, and will, also, be applicable to the removal of sunken rocks, under all circumstances of difficulty, wherever they may be located.



LEWIS' PATENT SUBMARINE DRILLING MACHINE.

Fig. 1 is a perspective view of this machine as it appears in operation. It consists of a steamboat, with screw propeller, having amidships a gang of vertical drills worked by steam power, with crane for raising weights and pieces of broken rock, and a device whereby the vessel, when the drills are at work, may be raised entirely above the waves, at which time its weight is supported by six adjustable pillars, placed as shown in the engraving. It also comprises an apparatus whereby, when the vessel is moving from point to point, the whole gang of drills may be raised simultaneously above the bottom of the vessel, and the frame-work at the lower extremities let into a recess in the bottom of the boat so as to be entirely out of the way in going over shallows, sandbars, etc. It includes, also, a device whereby any one of the drills may be withdrawn and entirely taken out, while the others are in active operation, thus avoiding loss of time by stoppages.

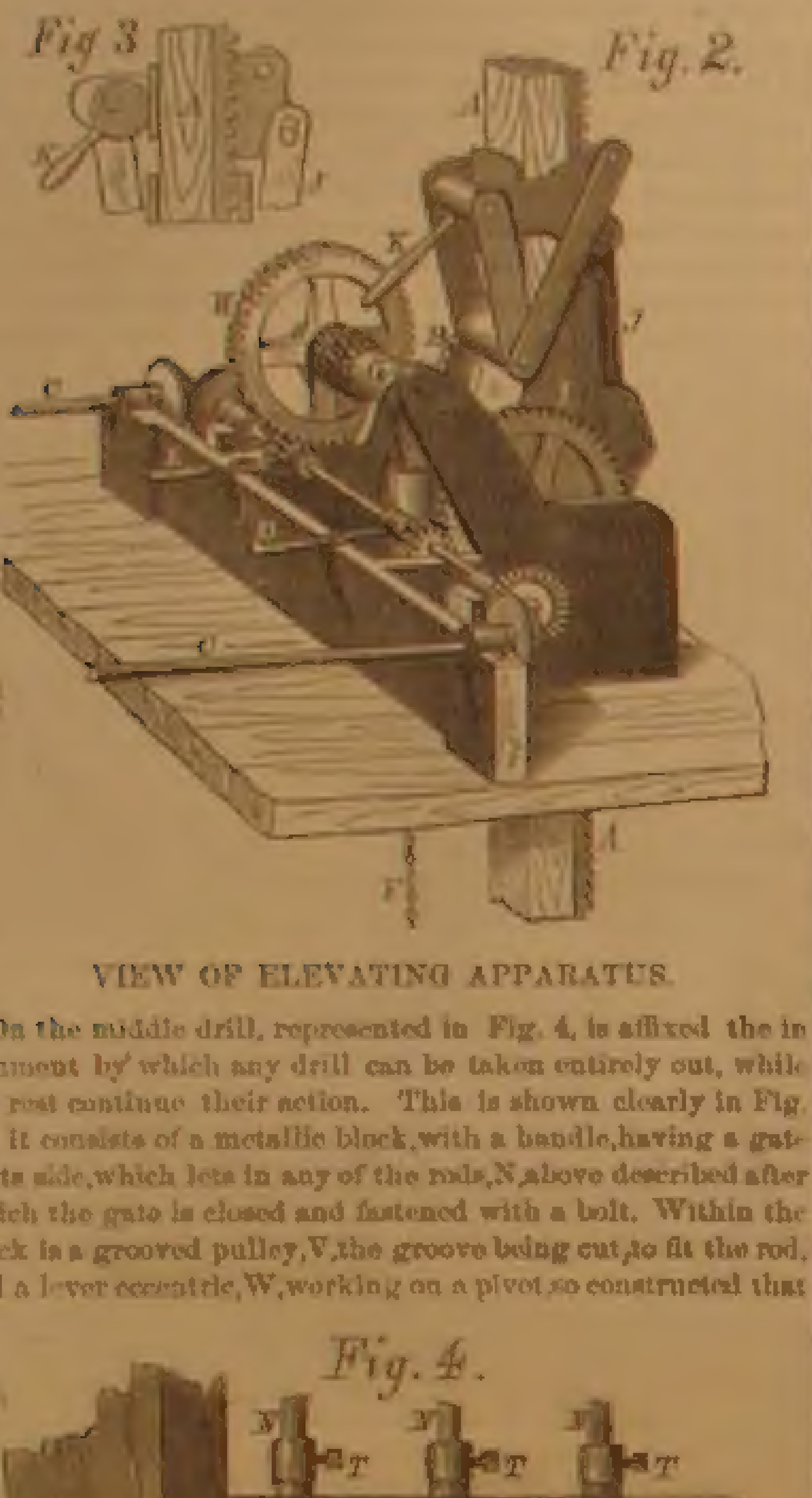
The important details of this invention are shown in Figs. 2, 3, 4, and 5, which are respectively a perspective view of the gearing attached to each pillar upon which the boat is elevated when at work; a detail of the same; an elevation of a set of three drills, showing the manner of working them, with the instrument employed to take out a drill while the machine is in operation, attached to one of them, and a perspective view of this instrument, showing its mode of operation.

The apparatus for raising the body of the boat is combined with that for elevating the horizontal frame-work through which the lower ends of the drills pass (see Fig. 1), and its details are shown in Figs. 2 and 3. A represents a portion of one of the vertical legs or posts upon which the boat is supported when at work, with a rack driven by a pinion, not shown in the engraving. This pinion is attached to a shaft which receives motion through the spur wheel, B. This wheel is driven by a train of wheel-work connected with a system of longitudinal and transverse shafting, C, placed beneath the deck of the vessel, not shown in the large engraving, but a portion of which is seen in Fig. 2. This train is run into gear or disconnected by means of the lever, D, and a sliding pinion. The boat being adjusted to the required hight, is kept in its place by a toothed dog, operated by a lever eccentric, K. The weight of the boat is then sustained by a system of bars, J, which hold it securely suspended. A section of the dog and eccentric is shown in Fig. 3, which gives a clear idea of this detail. The diagonal bar, shown in the engraving, is so connected with the other bars and with the toothed dog that, when the lever eccentric releases the dog, the latter drops back by its own weight. The boat and the other parts of the machinery may then be lowered as desired. The posts, made of very heavy timber, pass through a cast-iron trunk of great strength, attached to the bottom and top of the vessel and braced laterally by strong iron rods.

Another lever, E, operates a second sliding pinion, which engages with the spur gear, H, thus putting into action, when wanted, a windlass and chain, which lift the frame-work at the lower end of the drills—shown in Fig. 1—to any desired hight, or draws it up into a recess, provided for that purpose, in the bottom of the boat. Each of the posts has this apparatus attached, which may be separately run out of gear, and the post let down until it reaches the bottom, when all may be simultaneously run into gear, so that the boat will commence to rise on an even keel, and continue to do so until the proper elevation is attained. The frame-work or drill rack, which is thus elevated or lowered, according to circumstances, acts, when lowered, as a guide to the points of the drills. In order that it may be elevated, it is necessary that the lower ends of the drills should be disengaged from it. This is accomplished by means of a longitudinal shaft, which, by means of bevel gearing, operates two transverse shafts, upon which screw threads are cut, running in nuts attached to the bottom of the vertical frame-work which supports the entire gang of drills above the deck of the vessel. This frame rests upon ways, so that the rotation of the shafts described causes it and the whole gang of drills to move together laterally, so that the timbers of the drill rack may rise between the drills. The shafting and bevel gearing are shown in Fig. 1, near the deck of the vessel. The lower frame-work or drill rack acts as a lateral bracing to the posts, as well as serving to guide the drills when at work, so that on uneven bottoms those supports which find a foot-hold first, share the lateral strain with such as have not yet reached the bottom.

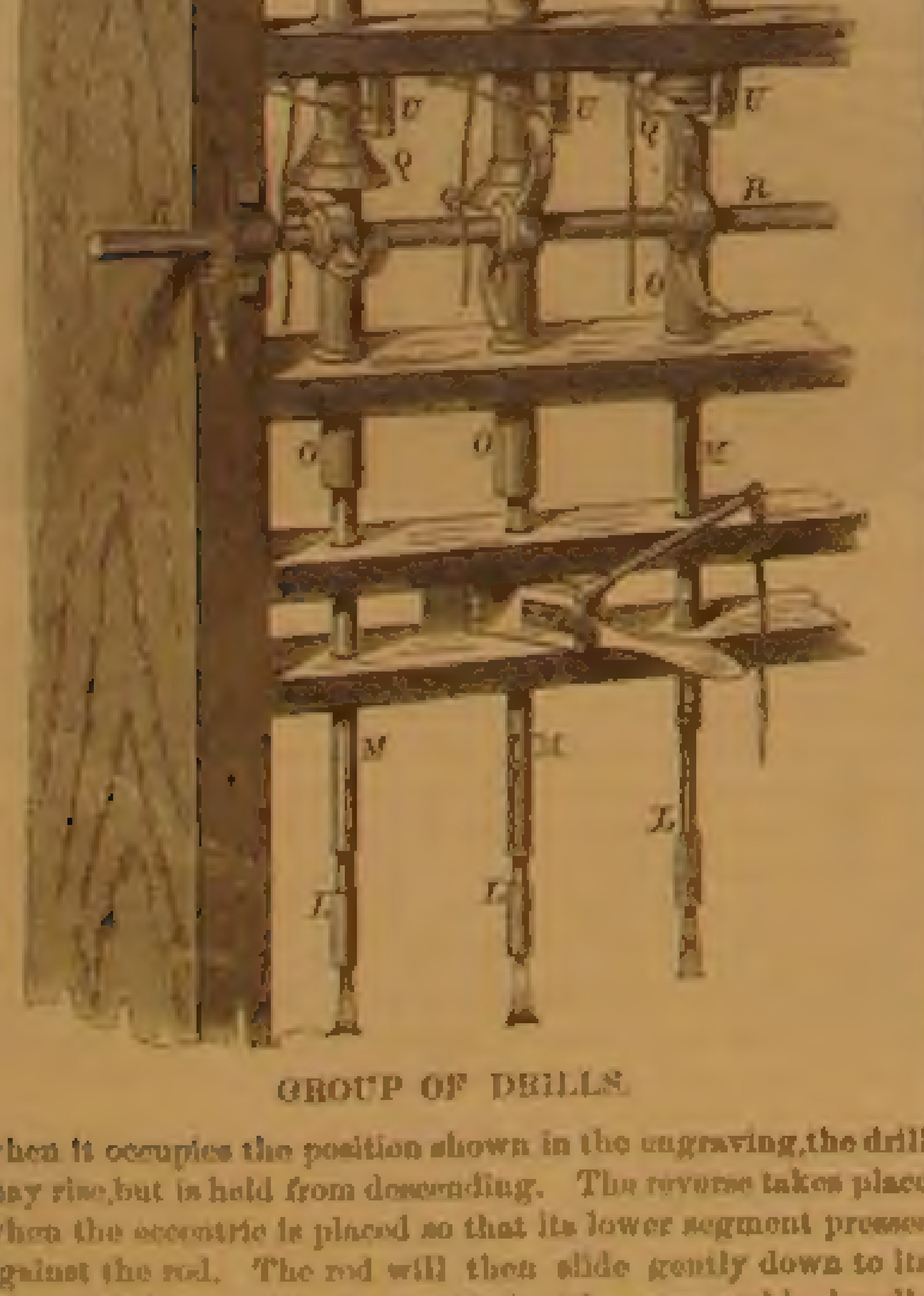
Fig. 4 is a perspective view of three of the drills drawn to a larger scale, showing the way in which they are worked, and also the method of applying the instrument, illustrated in Fig. 5, for removing a drill. The drills, L, play in slotted sleeves, M, which are firmly attached to the lower ends of solid rods, N. A pin passes at right angles through the upper part of each drill, the ends of which play in the slots of the sleeve, and serve to rotate the drill on its vertical axis, as will be hereafter shown. The rods, N, pass through sleeves, O, each provided at the top with a pair of lever eccentrics, P, and having collars, Q, about midway between their extremities. Motion is applied to lifting the sleeves, O, by means of a revolving shaft, R, with double cams, which not only raise the sleeves, O, but also give them a partial revolution as the cams act against the lower surfaces of the collars, Q. Both the upward and rotating motion of the sleeves, O, is imparted to the rods, N, and their attached sleeves, M, through the agency of the lever eccentrics, P, which firmly grip the rods, N, and hold them until the lever eccentrics are brought into contact with the disks. This contact releases the rods, N, and lets them, with the sleeves, M, fall upon the tops of the drills above described; a cylindrical piece of steel being inserted in the upper part of the sleeve, M, which imparts the force of the blow to the head of the drill. The disks, S, revolve when the lever eccentrics, P, come in contact with them, which

greatly lessens the friction. The drill is slightly elevated from the rock when the rod, N, is raised by the lower end of the slot in the sleeve, M, acting upon the cross pin, and then receives the rotary motion imparted through the cams, while the other parts are lifted. Set screws, T, are provided to hold any particular drill fast while the others are working, should occasion require it, and, also, to hold the drills while the boat is shifting her position. When any of the drills are not at work, the dogs, U, are made to engage with the under sides of the collars, Q, in such a way that they are slightly elevated above the cams; they then remain at rest. The dogs are operated by cords. The parts are so plainly shown in the engraving that they will be understood without further description.



VIEW OF ELEVATING APPARATUS.

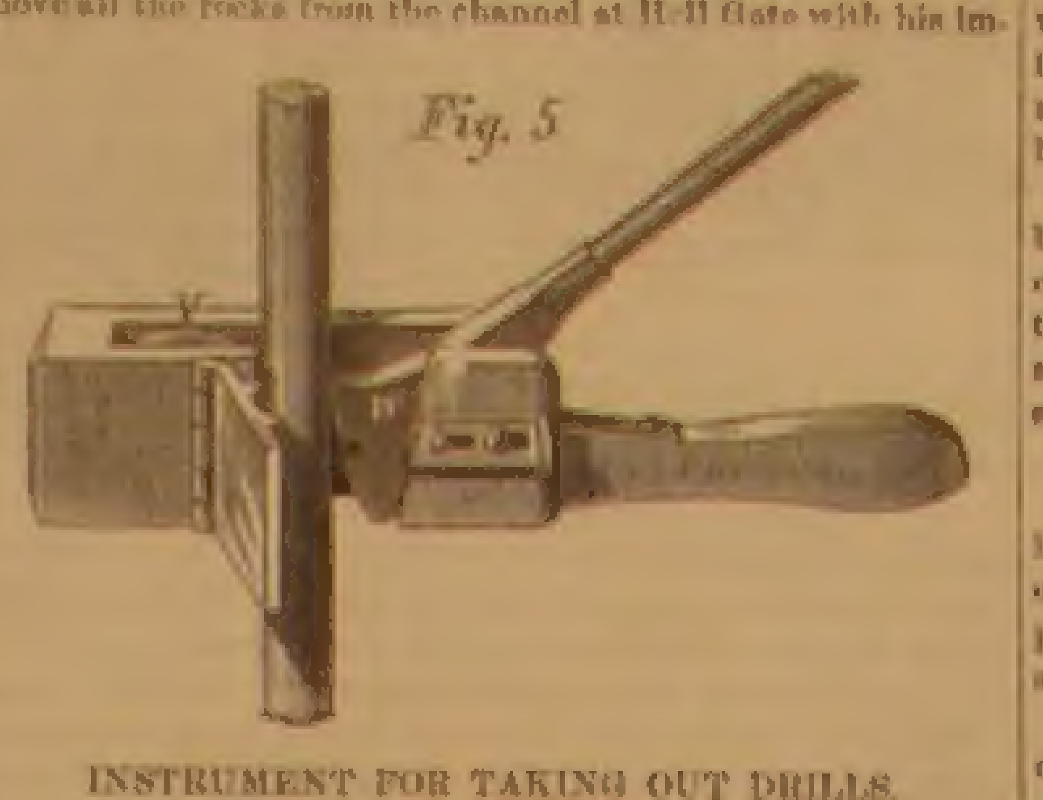
On the middle drill, represented in Fig. 4, is affixed the instrument by which any drill can be taken entirely out, while the rest continue their action. This is shown clearly in Fig. 5. It consists of a metallic block, with a handle, having a gate in its side, which lets in any of the rods, N, above described after which the gate is closed and fastened with a bolt. Within the block is a grooved pulley, V, the groove being cut, to fit the rod, and a lever eccentric, W, working on a pivot, so constructed that



GROUP OF DRILLS.

when it occupies the position shown in the engraving, the drill may rise, but is held from descending. The reverse takes place when the eccentric is placed so that its lower segment presses against the rod. The rod will then slide gently down to its place. This eccentric is provided with a removable handle and a cord by which it may be operated by a person stationed below it.

The advantages which this machine is claimed to possess over other devices which have preceded it are very numerous. Its independence of tidal action; capability of drilling one or many holes at once; power of inserting a bar into each hole after the drill is taken out, so that it may readily be found by a diver; the practicability of lowering cartridges through the tubes after the drills are taken out; the retention of the long-tried and approved hand-drill motion, are features which will at once attract the favorable attention of practical engineers. The inventor seems to have comprehended and provided for all the emergencies of submarine drilling and blasting, and is confident that in one year's time he could clear out and remove all the rocks from the channel at Hell Gate with his improved apparatus.



INSTRUMENT FOR TAKING OUT DRILLS.

A company is now being organized to build this machine.

Address Wm. H. Cammyer, Union Base Ball Grounds, Brooklyn, N. Y., or the inventor, Samuel Lewis, at the same place.

ALUMINUM—ITS MODE OF WORKING, AND ALLOYS.

SOLDERING ALUMINUM.

The peculiar difficulty which was encountered for years in the soldering of aluminum has been a great drawback for its more general application. The common method of brazing with borax is not applicable for this metal, because it corrodes and oxidizes it. At first, tin solder was used, but that afforded little solidity; and riveting was soon found out to be too tedious a process. Happily the difficulty has now been surmounted by Mouray, of Paris. The specimens of articles manufactured by his method were first exhibited at one of the meetings of the famous *Société d'Encouragement*. Among these were especially noticed a coffeepot with eight solderings, several eagles for the banners of the French army, and a trumpet, consisting of forty-two parts.

Soldered strips of sheet aluminum in being bent to and fro, never gave way at the soldered spot, but always outward of the same, which, as is well known, is not the case with the best silver soldering.

Mouray employs five different solders, which are composed as follows:

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	
80	85	88	90	94	parts in weight of zinc.
8	6	5	4	2	" " copper.
12	9	7	6	4	" " aluminum.

These ingredients are melted in a crucible. The copper is fused first, and the aluminum is then added in three or four portions. When the whole is liquefied, it is stirred with an iron rod. The crucible is then withdrawn, and the zinc introduced into the mass under constant stirring. It should be free from iron. The liquefied mass is poured in ingot-like molds, which have been wiped out with benzine.

The selection of the solder depends upon the nature of the object. In order to quicken its fusion on the metal, a mixture of three parts of balsam of copaiva and one part of venetian turpentine is made use of; otherwise the operation is performed in exactly the same manner as in the brazing of other metals. The aluminum solder is spread without delay on the previously heated surfaces to be fastened together. In heating, the blue gas flame or the turpentine blast lamp is employed. The more and oftener the solder is spread over the surface the better it is.

ON OTHER MANIPULATIONS IN THE WORKING OF ALUMINUM.

In order to avoid trouble in casting aluminum, the metal should not be put all at once in the crucible, but only in small portions, and new ones should not be added until those previously added are melted. Oxidation is prevented by previously dipping the pieces in benzole, and when it is intended to melt the drippings obtained in the working of this metal, it is necessary to clean them from the solder which may adhere to them, otherwise the casting will be spoiled. By allowing the pieces to remain for some time in nitric acid, the solder is corroded but the aluminum is left untouched.

The annealing of articles made of aluminum is not attended with more difficulties than that of other metals. The operation is performed when the metal commences to glow; in case, however, that fears should be entertained about the striking of the right moment, the object to be heated may be spread over with some fatty matter, which, in disappearing, indicates the time when the object has to be withdrawn from the furnace.

When to be rolled out, it must be annealed oftener than other metals. This is now attained with great ease.

In 1857, the cost of the rolling of one pound of aluminum amounted to 13 1-3 Prussian thalers, while at present it is only one tenth of that price. In burnishing or spinning aluminum in the lathe, it is necessary to make use of a varnish, consisting of four parts of turpentine and one of stearic acid.

One of the many interesting peculiarities of the new metal is its property of resisting the action of the graver, which slides off from its surface as if it were glass. When, however, a mixture of rum and the above-mentioned varnish is employed, the graver penetrates into it as if it were pure copper.

In polishing of aluminum, the substances generally employed for this operation are of no utility. Mouray recommends the use of an emulsion of equal parts of rum and olive oil, made by shaking these liquids together in a bottle. When the stone is used, the peculiar black streaks first appearing should not be a reason of vexation, since they do not injure the metal in the least, and may be removed with a woolen rag. The objects in question may also be brightened in potassa lye, in which case, however, care must be taken in not making use of too strong a lye. For cleaning purposes, benzole has been found best.

Finally, it may be mentioned that objects of aluminum can be electroplated without the least difficulty, and Mouray succeeded in imparting to them a bright, white luster in passing them successively through a weak bath of hydrofluoric acid and aqua-fortis. The effect thus obtained is said to be really surprising.

THE ALLOYS OF ALUMINUM.

We have to distinguish between alloys in which the aluminum predominates and such ones in which the other metals outweigh the latter. Those impart to the aluminum new properties. Iron and copper do not act injuriously if the admixture is not considerable.

In regard to toughness, the union of seven per cent of iron can scarcely be distinguished from pure aluminum. Both metals easily combine with each other. Commercial aluminum mostly contains iron; it remains ductile with as much as ten per cent of copper, and when containing only half as much, it may be worked still easier. If alloyed with small quantities of zinc, tin, gold, or silver, the metal is rendered hard and more brilliant, but remains ductile. Especially recommended is the alloy consisting of ninety-seven per cent of aluminum, and three per cent of zinc. The alloy with seven per cent of tin can be worked well, but does not take a very fine polish, and cannot be cast, since a more fusible alloy with a large proportion of tin is separated.

Aluminum and lead do not unite. The composition with three per cent of silver and ninety-seven of aluminum possesses a beautiful color, and in equal parts they yield an alloy of the hardness of bronze. The union of ninety-nine per cent of aluminum and one of gold is, though hard, still ductile; its color is that of green gold. With ten per cent of gold, the composition is rendered crystalline.

The most important alloy, however, is that composed of ninety per cent of copper and ten per cent of aluminum. It possesses a pale gold color, a hardness surpassing that of bronze, is susceptible of taking a fine polish, and is easier forged than soft iron. This alloy has found a ready market, and if less costly, would replace red and yellow brass. Its hardness and tenacity render it peculiarly adapted for journals and bearings.

Christofle, of Paris, who uses it for a journal for a polishing disk, found that it lasted six times longer than ordinary journals—that is, eighteen months. There were 2,200 revolutions made per minute. It is further stated, on good authority, that a journal of this new bronze which was employed for the axle of a sewing machine, making 240 revolution per minute, did excellent service for one year without indicating the least deficiency. Journals of ordinary bronze do not, as is well known, last over five months.

Percussion Cap Experiments.

Some experiments to demonstrate the safety in the carriage and transportation of percussion caps took place on the 29th of April, at Birmingham, England. The principal railway and canal companies were represented. The experiments took place under the direction of the Chamber of Commerce.

PROGRAMME OF EXPERIMENTS.

1. A tin box, containing 250 caps, to be held in an ordinary fire until all the charges in the caps are burnt up.
2. An iron pot, containing half cwt. of caps, to be put into a red-hot muffle.
3. A wooden packing case, containing 50,000 caps, put up in the ordinary way for transit, to be placed in a furnace.
4. In an iron pot, 10 in. diameter and 10 in. deep, a lump of red-hot iron, weighing 2 lbs., to be placed at the bottom; 20,000 loose caps to be poured on the hot iron; the iron pot to be filled up with cotton wool; the whole to remain until the heat of the iron has exploded all the caps.
5. A brown paper parcel, containing 5,000 caps, to be struck by a mass of iron weighing one cwt. falling from a hight of twelve feet.
6. A box, containing 5,000 caps put up in the usual way to be struck by a mass of iron, weighing one cwt., falling from a hight of twelve feet. The box to be surrounded by cotton wool.
7. A parcel, containing 5,000 caps, placed in a box with a quantity of cotton wool, to be struck by a mass of iron, weighing fifteen cwt., falling from a hight of four feet.
8. A bag, containing 20,000 caps, to be placed on a rail under the wheel of a locomotive engine.
9. Two wooden packing cases, containing 50,000 caps each, put up in the ordinary way for transit, to be submitted to any concussion practicable on a railway, by attaching it to the buffer (not a spring buffer) of an engine or otherwise.

The delegates from the different companies expressed themselves as entirely satisfied with the results of the experiments, and were convinced that fears hitherto entertained by some companies are groundless.

Silver Extraction—Electro-Chemical Treatment.

To do away with the tedious and expensive process of amalgamation in the production of pure silver, is a feat which Becquerel, Sen., of the French Academy of Sciences, asserts he has recently accomplished, after having experimented on this subject since the year 1835.

The experiment was tried successfully on 40,000 lbs. of silver ores from Peru, Mexico, and Chili, etc.

A powerful battery, with double liquid voltaic elements, separated by porous diaphragms, was made to act on the prepared ore, from which the pure silver was thus obtained at once in a finely divided state and in a crystalline form.

Messrs. Wolf and Pioche are at present, it is said, preparing for a trial of this system in California. The details we have of the process are too meager for us to venture on an opinion as to the efficiency of this apparently simple and novel metallurgical method of treating the ores of the precious metals.

CHINESE LABOR IN AMERICA.

We condense from a long article in the *Atlantic Monthly* the following facts relating to Chinese labor in America:

"It also happens just now that we are laying down a service-pipe to an immense reservoir brimming over with labor. The Chinese have already found their way to our Pacific coast. They are at work on the railroads, in mines, forests, fields, factories, and the kitchens and chambers of our friends in California. They are in Oregon, Montana, Nevada, and Idaho. When the Pacific Railroad is completed, they will be at Salt Lake City and Omaha, and in time will make their appearance in Chicago and Boston.

"The supply of labor in China is unlimited. We are to think of a territory not larger in area than the United States east of the Rocky Mountains, but containing a population of four hundred millions. One half of the people are only able to gain their daily bread. Two hundred millions in that country have faint hope of ever making any headway, and hence the readiness to seek their fortunes in foreign lands. They are at Singapore, where several hundred thousand have taken possession of the lower end of Malacca, and trade with vessels touching at that port. They are on all the islands of the Indian Archipelago. They swarm in the gold fields of Australia; the Sandwich Islands will soon be in their hands, and they will supply San Francisco with sugar. They are to be found all the way from Chili to Oregon.

"Nearly all those who are thus seeking their fortunes abroad are from southern China, where a remarkable spirit of enterprise and adventure has been lately developed. Companies, like those established in London two and a half centuries ago for the settlement of North America, have been formed at Canton and San Francisco for the encouragement and protection of the Chinese emigrants. The one hundred thousand now in this country are but pioneers of the millions who will follow by and by.

"It is evident that henceforth we are to look westward as well as eastward, for laborers. We are accustomed to think of the Chinese as belonging to a degraded race, ignorant of civilized life, and unable to compete with the skilled labor of Europe. But we have this fact before us, that China as a nation makes the whole world her debtor. We want her tea and silks, and can obtain them only by paying cash. We have also the fact that the Chinese have established themselves in the woolen mills of California, producing cloth which won a prize at the World's Fair.

"The Chinaman works patiently, and will not stipulate for three evenings a week to visit friends. St. Patrick's day is not in his calendar. He wants only a week at New Year.

"The Chinese are not disposed to be aggressors upon the rights of others, neither will they allow any infringement of their own. They wage no war, but, if treated unkindly, quietly go their own ways, seeking business somewhere else. 'I no do for you, you no do for me. I go.' And he is off at once. He fully understands what some Anglo-Saxons as yet have failed to comprehend, that the hiring of servants does not include the privilege to abuse them.

"'I have had a Chinaman,' says a gentleman of San Francisco, 'nine years. When he came into my family he could not speak a word of English. He knew nothing about cooking. My wife went into the kitchen, and showed him how to make a pudding and a pie, and after a few days' observation he mastered the mysteries of the culinary art, and has cooked to our satisfaction from that time to the present. He is faithful and honest. I would intrust every dollar of my property to him as soon as I would to one of my own countrymen.'

"Another gentleman gives this testimony: 'I have had a Chinese servant several years, and when I go into the country I leave my house in John's hands. He hides my silver plate and other valuables, and does not leave the premises a minute. When I return I find everything in perfect order. I do not think he ever took a dollar that did not belong to him, though he has had opportunities to do so. He purchases all my groceries, and invariably makes better bargains than I can myself. I would trust him much quicker than I would many Americans in my employ.'

"It is only the lowest class of Chinese that have thus far reached our shores as servants and laborers; but let these receive kind treatment, let them have the same protection for life and property which is given to all others, and in time a different class will make their appearance. It would be comparatively an easy matter to obtain Chinese labor through the societies already established at San Francisco and Canton. These are not emigration companies, but mutual-aid societies, and they might be used for conveying information to the millions in China concerning the field open here to laborers of every description, but especially to house servants. Although the Chinamen cannot speak a word of our language when they arrive, in a few days they master enough to understand what we want.

"It is to be hoped that, as the Pacific Railroad is now completed, the experiment of bringing to this side of the continent some of the Chinamen now employed as house servants in California will be tried. If they prove to be as good as they have been represented, housekeepers may regain their lost liberty."

POWER CONSUMED BY DRILLS.

Van Nostrand's Engineering Magazine gives some extracts from a report by Captain Clarinval, Professor in the Artillery and Engineers' School, at Metz, upon the above subject, which we place before our readers for the consideration of practical men. We think exceptions will probably be made to some of the conclusions, and would like the views of practical men upon the subject. We give in a condensed form some of the principal conclusions. The dimensions used are stated in fractions of a meter, which may be reduced to inches by multiplying by 39·37:

In order to ascertain the power required to bore a hole of given diameter in wrought iron, the following points must be considered: The kind of iron, the direction in which the hole is bored, its depth and diameter, the lubricating material, the form of the drill, and its speed. The experiments were conducted with an ordinary drill press, while the power consumed was measured by Morin's dynamometer. The wrought irons used in the experiment were a very hard variety, forged under the steam hammer at the forges at Montigny-les-Metz, and a soft rolled iron from the iron works at Abainville. The drills used were center bits and a flat drill of exactly equal diameter, driven at the same speed, and lubricated with oil and afterwards with soap suds. Cast iron, bronze, and steel, were then similarly experimented on. The conclusions derived from the above experiments were the following:

(1). The amount of power necessary to drill with a center-bit into wrought iron, remains quite constant so long as the depth of the hole does not exceed 0·05 meter; as soon as this limit is passed the required power increases rapidly.

(2.) The power consumed in boring across the fibres is almost independent of the depth of the hole; the original power is, however, somewhat greater than that required to drill in the other direction. Since, however, the power required in boring in the latter direction increases greatly with the depth, the total power required to bore a given hole across is much less than that required to bore it in the direction of the fibers.

(3.) The power required to bore a hole of given diameter increases with the hardness of the iron. The use of oil to lubricate the drill diminished the power required about 0·2, as compared with that required when soap suds were used. This holds good as well in hard as in soft wrought iron.

(4.) The results obtained with center bits hold good also for flat drills; the latter, however, require a greater power than the former, as is shown below.

(*a*.) The power required by a flat drill 0·025 meter in diameter, to bore a hole in the direction of the fiber, is about 1·25 times as great as that required by a center bit of similar diameter operating under similar circumstances.

(*b*.) The power required by a flat drill, 0·025 meter in diameter, to bore across the fibers, is about 1·4 times as much as that required under similar circumstances by a center bit.

(*c*.) When the diameter of the drills is 0·015 meter, the above quantities become 1·6 and 1·8 respectively, which seems to show that small drills require a comparatively greater power than large ones. When the diameter of the drills is 0·008 meter, the above proportion becomes 1·52, which corroborates the above conclusion.

These results agree with practice, since the flat drill is commonly used only for holes 0·008 meter in diameter, and under, which do not permit the use of the center bit or pin drill.

EFFECT OF VELOCITY.—In order to estimate the effect of the velocity of the drill, a drill of 0·025 meter was driven at a speed (on its circumference) of 0·22 meter per second, and also at a speed of 0·125 meter. The power consumed per second is clearly less at a slow speed than at a high one, but the power required to bore a given hole is about the same in each case. For instance, the power required to bore a hole 0·0074 meter deep (in the direction of the fibers) at a speed of 0·22 meter, amounted to 23·49 meter kilogrammes, and to 21·8 at a speed of 0·125 meter; across the fibers, the power required at the high speed was 24·3 meter kilogrammes, and 22·3 at the low speed.

It appears then that the power required to drive the drill at either speed is not very materially different. Hence, the reporter concludes that the speed of the drill should be as great as possible, to diminish the resistance offered by the metal, and that the feed should be heavy, and both so far as possible without destroying the edge or boring too rough a hole.

The average advisable circumference speed of drills is 0·12 meter per second in wrought iron, 0·06 meter in cast iron, and 0·15 to 0·18 in bronze (gun metal). When these velocities are exceeded the drill is apt to become soft, and when they are not reached the work is not economical.

A comparison of results obtained with borers of both kinds of the same diameter (0·25 meter), shows that the power required to drive a flat drill in cast iron is 2·6 times as much as that required to drive a center bit.

Experiments on hard white cast iron, showed that the power required to drill such iron was very nearly double that stated for gray cast iron. It appears from the tables that the power required to drill cast iron is nearly constant, no matter what the depth of the hole may be.

The experiments made on steel showed that, under similar circumstances, more power was required to drill shear or soft steel than to drill hard cast steel, and that flat drills increased the power necessary by at least one third.

Capt. Clarinval concludes with the following remarks:

1. Nearly the same power is required to drill hard wrought iron and hard cast steel.

2. The power required to bore soft steel is not much greater than that required for hard wrought iron, but the former increases rapidly with the depth of the hole. Thus, at a depth of five or six millimeters, the power consumed in drilling with soap suds in soft steel, a hole fifteen millimeters in diameter, is equal to that consumed in boring one of twenty-five millimeters in diameter in hard wrought iron.

Baron Liebig "On a New Method of Bread-making."

Baron Liebig has just made some important researches on a new method of bread-making. He remarks on the stationary character of this art, which remains much in the state in which it was thousands of years ago. He dwells upon the sanitary importance of the mineral constituents of grain, and the necessity of a sufficiently abundant supply of them in bread. These are best found in certain kinds of black and brown bread, which are, therefore, more wholesome than the white bread that is, nevertheless, preferred by most people (especially by the lower orders), on account of its better appearance and superior palatableness. The problem has hence arisen, how to provide a beautiful white bread which shall contain all the essential mineral constituents of black bread. These mineral constituents (phosphate of potash, lime, magnesia, and iron), are introduced into the bread by the use of the baking-powder invented by Professor Horsford, of Cambridge, in North America. This baking powder consists of two powders—the one acid, the other alkaline. The acid powder is phosphoric acid in combination with lime and magnesia; the alkaline powder is bicarbonate of soda. Two measures, made of tinned iron, the larger one for the acid powder, and the smaller one for the alkali, are employed. When bread is required to be made, every pound of flour is mixed with a measure of the acid powder and a measure of the alkali powder, and sufficient water added to make dough, which is presently made into loaves and baked. In one and a half to two hours, bread may be made by this process. The chemical change which takes place will be easily intelligible: carbonic acid is generated and phosphate of the alkali is formed at the same time. The essential feature in Horsford's invention is the economical getting of phosphoric acid in the shape of a dry, white powder. This is done by taking bones, burning them, and then treating the well-burnt bone-earth which consists of phosphate of lime and magnesia), with a certain quantity of sulphuric acid, so as to remove two-thirds of the lime and leave a soluble superphosphate of lime. The sulphate of lime which results from the action of the sulphuric acid, is separated from the rest by filtration, and the solution subsequently concentrated by evaporation, and, when it becomes very concentrated, mixed with a certain quantity of flour, and dried up. The mixture of flour with the superphosphate admits of being reduced to the finest powder, and constitutes the acid powder just referred to. It will be observed that the alkali powder contains soda, whereas potash is required in order to furnish the right kind of mineral salts. Liebig proposes to rectify this defect by using a certain quantity of chloride of potassium along with the alkali. Chloride of potassium is now tolerably cheap, owing to the finding of immense quantities of it at Strassfurt, in Germany.

Photographs in Quinine.

A salt is well known to pharmaceutists called the "*citrate of iron and quinine*." This is essentially a compound resulting from the combination of per-citrate of iron (containing some proto salt) with citrate of the well-known vegetable alkaloid, quinine. As usually sold it presents the appearance of a mass of fine greenish-yellow scales, which have been long known to be somewhat sensitive, when dry, to the action of light. The compound is so very soluble in water that it cannot be obtained in crystals; hence the solution of the substance is evaporated to dryness, and the residue sold as the citrate of iron and quinine.

But in this part of the manufacture of the compound a peculiarity has been introduced. The solution of the citrate of iron and quinine, after its preparation, is evaporated to a sirupy consistence; and now, instead of carrying the evaporation further in an ordinary dish, the sirupy liquid is painted over glass or porcelain plates, and the remaining moisture driven off in a hot-air chamber. When perfectly dry the compound is removed in greenish-yellow scales by scraping each plate with a knife. This is the general mode of making "scaled" preparations.

Mr. Wood, in preparing some of the citrate of iron and quinine in scales, conducted the final evaporation in the full light of an April sun instead of in the dark hot-air chamber; as the desiccation proceeded the salt decomposed easily under the influence of the solar rays, those parts of the plate crossed by shadows of bottles, &c., placed in a window, not giving evidence of any reduction. The change observed was simply a whitening of those parts which had been acted upon by light. The salt was now placed in water, and it was found that, instead of dissolving very rapidly as usual, a white residue was left on treatment with water, and this white substance subsequently dissolved very slowly.

The question may now be asked—What is the white insoluble substance resulting from the action of light on the double citrate of iron and quinine? Mr. Wood believes that this white substance is *citrate of quinine*, no doubt accompanied by some proto-salt of iron. If this be true, a photograph is, therefore, obtainable, in which a salt of quinine constitutes the lights of the picture; and so the title which we have given to this article is justified.

But our object in drawing attention to the matter here is to point out the curious and interesting fact (if it be so) that the simple destruction of a solvent, *i. e.*, solution of citrate of iron, appears here to be the prime cause of the production of the quinine photograph; thus affording us a more extended view of possible processes than we would otherwise have had, while the experiment alone is interesting as touching the manufacture of a beautiful compound of per-citrate of iron—a substance which has long since attracted attention in consequence of the facility with which it is acted upon by light.—*British Journal of Photography*.

THE name of the thimble is said to have been derived from "thumbell," having been first worn on the thumb as the sailor's thimble still is. It is a Dutch invention, and was introduced into England in 1695 by John Lofting who manufactured it at Islington.

Improvement in Railroads.

In the month of August last, a party of civil engineers, newspaper reporters, and men of science, met at Rainey, near Paris, in order to witness the experiments which were to be made on a new system of railroad invented by M. Larmanjat.

The track had been laid from the village of Rainey to Montfermeil, a distance of about four miles along the public highway. The excursion train, a representation of which we here furnish, was in waiting for the invited guests. A liliputian locomotive, named the "Swallow," stood at its head, and was coupled to a series of elegant little cars, each of which held sixteen persons.

LARMANJAT'S RAILROAD FOR ORDINARY HIGHWAYS.

The novel feature of the invention consists of a single rail, like a long ribbon, extending along one side of the road. One wheel placed at the forward part, alone bears on this rail, while the two other wheels rest on the ground. The cars are furnished with two wheels, placed underneath in their long axis, which rest on the rail and support their weight, while two other wheels, destined to preserve their equilibrium, are placed outside.

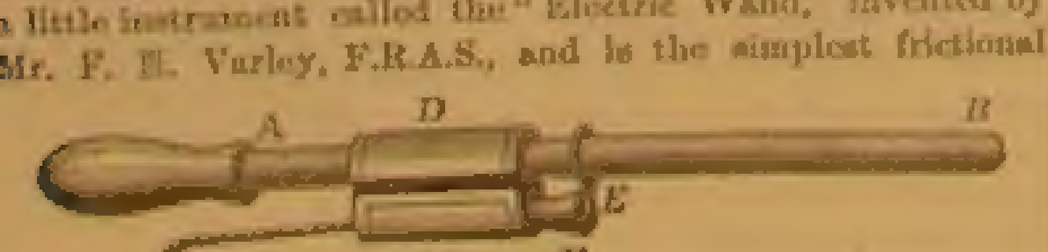
A few minutes after starting, and while the train was running at a speed of ten miles an hour, it reached a grade of 410 feet to the mile, which, to the surprise of all present, it ascended without any apparent slacking of the speed. The first result was conclusive in favor of the system proposed, as it showed, beyond a doubt, the possibility of overcoming the difficulties inherent to the ascent of extraordinary steep grades.

A portion of the road presents a series of very short curves of a radius of only sixty-five feet: these the train followed with marvelous smoothness and regularity. On the return trip the brakes were so perfectly adjusted that the velocity on the rapid descents was kept constant at all times. The train ran to Moutfermeil in twenty minutes and returned in seventeen.

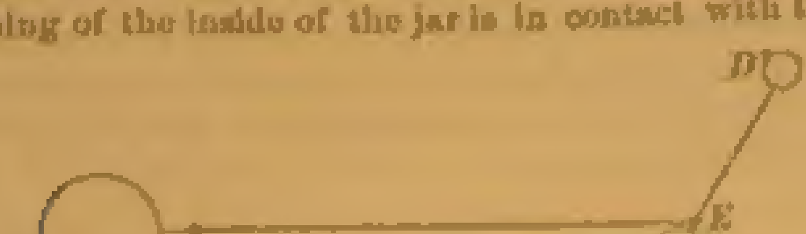
The general result of this trial trip was considered satisfactory in every respect, and M. Larmanjat received the approbation of all present. He had achieved a success, and proved the possibility of establishing cheap and light railroad lines and trains. For local purposes the system seems to be well adapted. The locomotive used on the occasion weighed only three tuns. The estimated cost in France of building such a line, including labor and material, amounts to 289,000 francs for twenty kilometers, or about $57,800 in gold for a length of fifteen miles.

The Electric Wand.

A novelty which in the hands of the London Stereoscopic Company, has deservedly begun to meet with a large sale, is a little instrument called the "Electric Wand," invented by Mr. F. H. Varley, F.R.A.S., and is the simplest frictional



electric machine in the world, as compared with its power. It consists of a glass tube, A, B, fixed at one end in a wooden handle. The rubber with its flap D, carries a little Leyden jar, the end of which is visible at F. This jar is coated inside and out with a resinous insulating compound, and the metallic lining of the inside of the jar is in contact with the brass



collecting ring, E. The handle being held in one hand and the rubber in the other, when the tube is rubbed the little ring and jar rapidly collect plenty of electricity. A half-inch spark and smart shock may be readily obtained from this apparatus, the length of the spark depending upon the amount of rubbing each time before the jar is discharged. The tube may be cold and damp when first taken in hand, but it soon warms into proper working condition. This instrument is also unlike the common frictional machine, in that, when the conductor is once charged, several experiments may be performed with it to show the attractions and repulsions of pith balls, before fresh friction is necessary, for the jar is virtually a condenser of considerable inductive capacity. When it is not desired to take the shock through the arms, the jar may be discharged by means of the metallic cord, H. Among the auxiliary pieces of apparatus made necessary to accompany the wand, is an electrical orrery of great simplicity, and capable of giving three different motions. The orrery is all balanced on a pivot at F. The light hollow brass ball, A, represents the sun, and pith balls, B and D, the earth and moon, rotating round the pivot E. The metallic points projecting from B and D, in opposite direction, of course cause these to rotate round each other; but the leverage of the point D being from its position greater than the leverage of B, it sets the long arm of the orrery in rotation upon the pivot, F.—*The Engineer.*

THE TARANTULA OF TEXAS.

We have lately received, says the *Entomologist*, several specimens of this large ground spider from some of our subscribers in Missouri, and we therefore present herewith a life-size portrait of it. Large and formidable as it appears, it yet

has a deadly enemy in a large species of Digger-wasp (*Pompilus formosus*, Say), which stings and paralyzes it. The *American Naturalist* has the following interesting observations on this wasp which were made by Dr. G. Lincecum:

"This large and conspicuous insect is everywhere in Texas called the Tarantula Killer, and is over two inches in length; the head, thorax, abdomen, and long spiny legs are all black, while the wings are sometimes of a bright brown, with black spots at the tips. It is armed with a formidable sting, which it invariably uses in taking its prey. * * * It takes its prey by stinging, thus instantly paralyzing every limb of its victim. The effect of the introduction of its venom is as sudden as the snap of the electric spark. The wasp then drags it, going backwards, to some suitable place, excavates a hole five inches deep in the earth, places its great spider in it, deposits an egg under one of its legs, near the body, and then covers the hole very securely. A young Tarantula Killer will be produced from this egg, if no accident befalls it, about the first of June of the ensuing year. * * *

"The Tarantula Killers have severe fights with each other. It occasionally happens, when one of them succeeds in capturing a Tarantula, that another one, or more, flying around in that vicinity, and smelling the odor that arises from the Tarantula Killer when she uses her sting, which resembles the odor of the paper-making wasp (Vespa) only much stronger, takes the scent like a dog, tracks the Tarantula following it up closely, and makes a violent effort to get possession of the paralyzed spider. A fight ensues, which occasionally terminates in the death of both parties; at other times the contest lasts but a little while, as the stronger party drives off the weaker, and takes possession of the prey.

"It is surprising to one who has been educated to believe that the faculty of reason belongs alone to man, to contemplate the consummate ingenuity which is displayed by these insects in their efforts to secure their eggs from the observation of their own thieving sisters, and to hide the food they have provided for their young during the period of its existence under ground."

Summer Recreations.

The mechanic and those who are on their feet a great deal, need not go on fishing excursions, or hunting, or boatings, or cricket plays, or base balls; they need muscular rest; they should sleep at night, and lie about in the daytime under the trees, on the grass, looking up into the sky, with several newspapers or other covering under them, to keep out the dampness from their bodies, eating regularly of plain food, with nothing between; with leisure, walking in the woods, beside the streams and along the road-ways; and when they get home in the autumn, they should at first work leisurely, until the new-made particles of flesh and bone gradually harden and become adapted to severe labor.

The student, the clerk, the book-keeper, the professional man, and all who have sedentary occupations, should hie to the mountains, enter no human dwelling day or night, but camp out and "rough it" for a month; this continuous exposure to out-door air, in hunting and fishing and climbing mountains all the time, will certainly work a wonderful revolution for the better, as to the healthfulness of every one who will try it; there will be no danger of colds; pouring, drenching rains will give no "Rheumatics." Except while actually eating and sleeping, be on the move in some way out of doors, in such a manner as to involve steady and varied muscular activities which will bring into exercise every part of the body and brain; the more varied, the more joyous, the better; turn everything into fun if possible; let uproarious laughter rule the hour; let jest and joke and song and loud hurrahing be the order of the day, at least for an hour after meals, and another hour during each repast. Go and spy out the land, taking a different direction every day from your camping grounds. Endeavor in some way to add to the sum total of human knowledge of actual facts. There is no better place in the world for these things than the Adirondack mountains. —*Hall's Journal of Health.*

GEOLOGISTS will be much interested in the reported discovery of Dr. Jenzsch, of Gotha. This savant, it is said, has devoted himself for some years to what he calls microscopic lithographic researches, and now announces that in various kinds of crystalline and volcanic rocks he has discovered minute animal forms in prodigious numbers, and in a fossil condition. Some of the creatures he describes as having been petrified in the midst of their "life functions." Among them he finds infusoria and rotifers intermingled with algæ, and he infers their formation in a large expanse of stagnant water.

Improvement in Letter Envelopes.

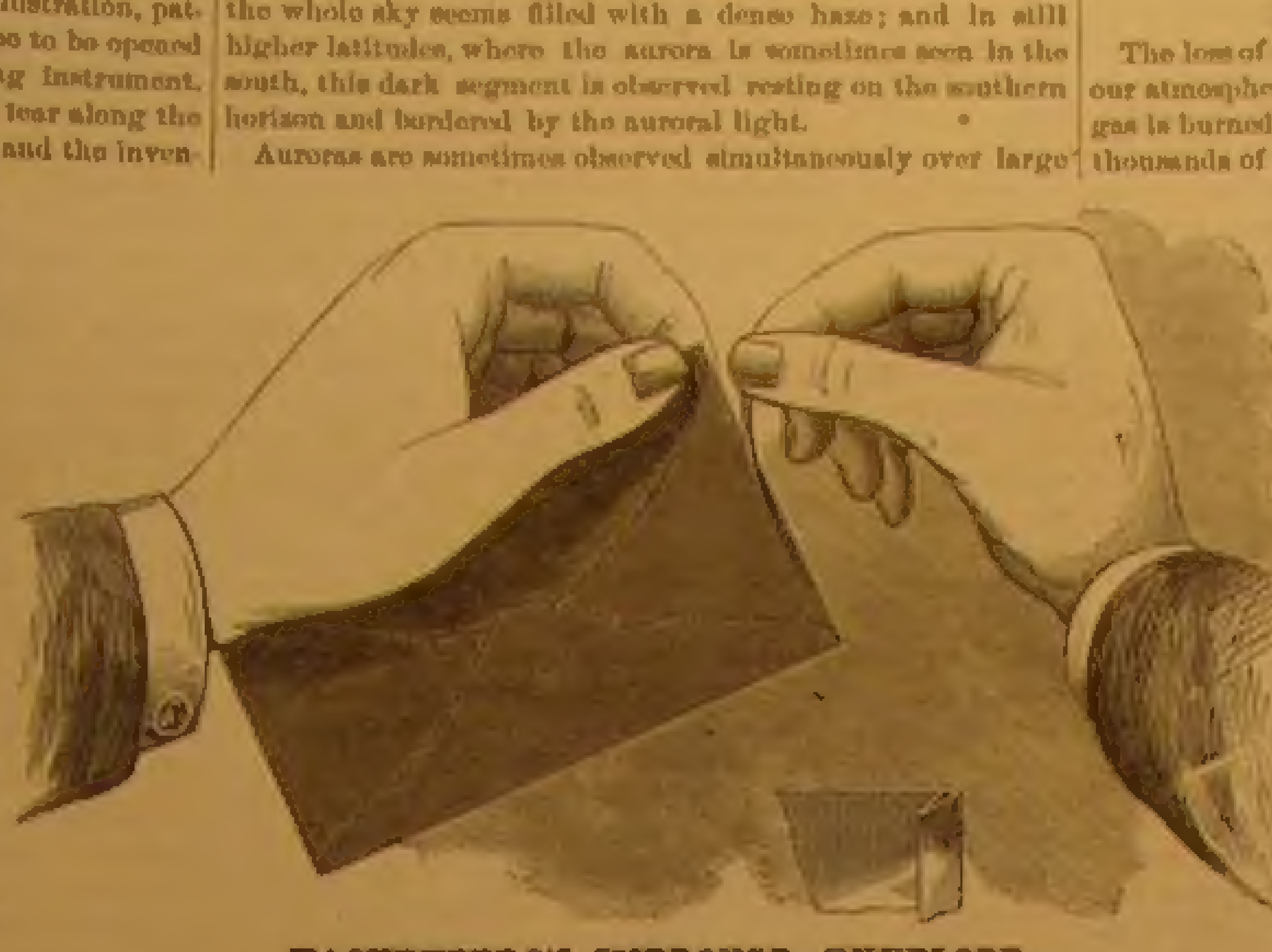
The demand for a speedy and easy method for opening envelopes has led to the invention of a number of cheap implements for the purpose, none of which, so far as we know, have proved very successful in practice.

The device of which we herewith give an illustration, patented by G. P. Hackenberg, enables an envelope to be opened easily and quickly without aid of any cutting instrument. Advantage is taken of the fact that paper will tear along the line of a fold more easily than any where else, and the invention consists in making a narrow double fold along one end of it, in the manner shown by the detail at the bottom of the engraving. The double fold gives strength to the portion to be torn off, so that there is no danger of its breaking.

The letter being seized in the left hand as shown in the engraving, the fold is stripped off, with a single motion of the right hand, without the least danger of mutilating the contents, and in much less time than it can be opened by any other method.

Clerks, and others who have felt the drudgery of opening a large correspondence, will appreciate the great saving in time obviously affected by this improvement, and for departments of the Government service it seems to be a *sine qua non*.

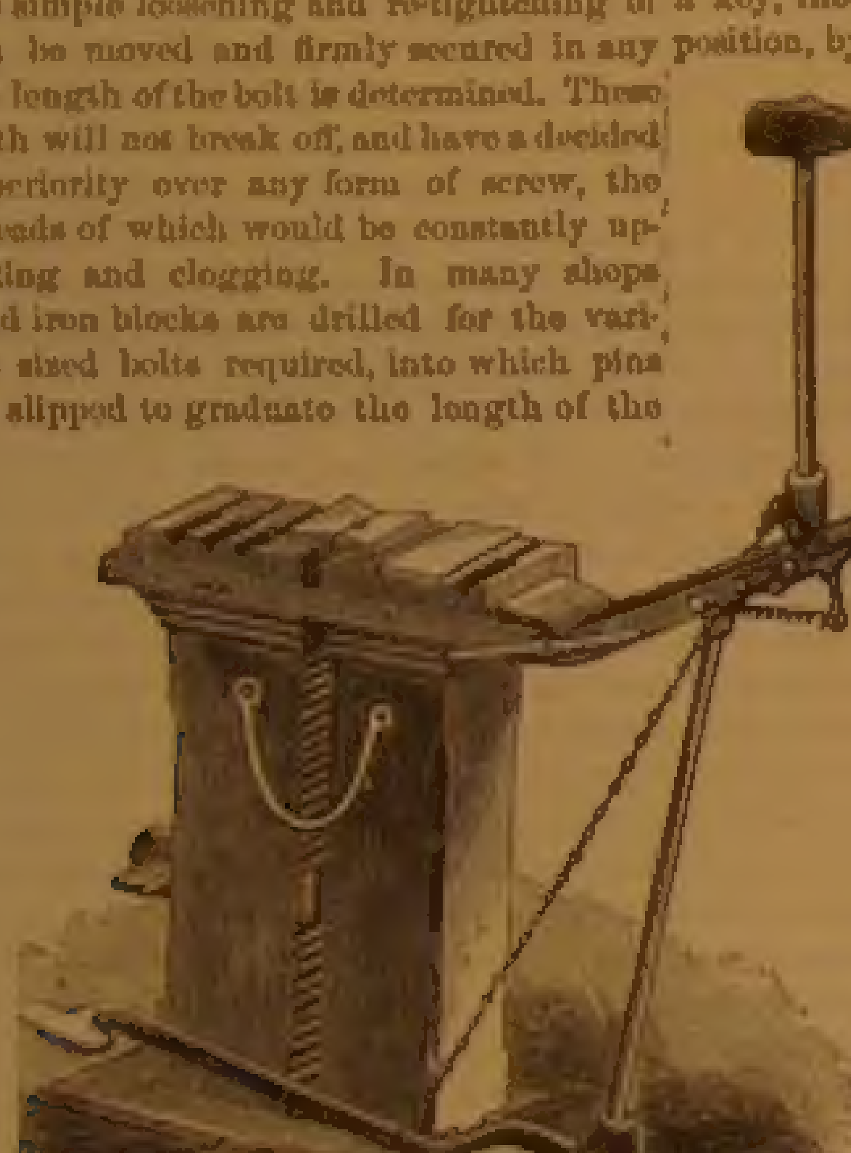
It is rare that we have brought to our notice a device at once so simple and effective as this. For further particulars in regard to rights for manufacturing this improved envelope address Major Joseph Bush, Fort Randall, Dakota Territory.



HACKENBERG'S IMPROVED ENVELOPE.

IMPROVED BOLT MACHINE.

We herewith illustrate a very useful bolt machine for every forging shop. It consists of two upright pillars—one stationary and one movable—the latter having its fulcrum at the base. In the top of these pillars are cast hexagon and round swaging channels, and a thick steel plate for anvil work. The dies are in halves, so arranged that they are brought together firmly and truly by the closing of the pillars, which is effected by means of the cam seen in front of the movable pillar. A sliding head, or "dog," is arranged with teeth, which mesh in a corresponding row of teeth running nearly the entire length of the stationary pillar of the machine. By the simple loosening and re-tightening of a key, the "dog" can be moved and firmly secured in any position, by which the length of the bolt is determined. These teeth will not break off, and have a decided superiority over any form of screw, the threads of which would be constantly upsetting and clogging. In many shops solid iron blocks are drilled for the various sized bolts required, into which pins are slipped to graduate the length of the



bolt. In the use of this machine there is no looking up of missing pins, or making off new ones. It is always ready for this important part of the smith's work. Attached to the upper part of the machine is a sledge, by which the workman can give with his foot any number of instantaneous and powerful blows on the heated iron. Forming dies can be inserted in this sledge, if required. It is a machine for all classes of blacksmiths, no power being required.

The patentees will dispose of the right to manufacture this machine for the Western States. Address L. E. Osborn, New Haven, Conn., who will also furnish machines.

Theory of Auroras.

The Polar light is a light which is frequently seen near the horizon, bearing some resemblance to the morning twilight whence it has received the name of aurora. In the northern hemisphere it is usually termed, "aurora borealis," because it is chiefly seen in the north. A similar phenomenon is also seen in the southern hemisphere, where it is called "Aurora Australis." Each of them may, with greater propriety, be called "Aurora Polaris," or *Polar Light*. They exhibit an endless variety of appearances. In the United States an aurora is uniformly preceded by a hazy or slaty appearance of the sky, particularly in the neighborhood of the Northern horizon. When the auroral display commences, this hazy portion of the sky assumes the form of a dark bank or segment of a circle in the north, rising ordinarily the hight of from five to ten degrees. This dark segment is not a cloud, for the stars are seen through it as through a smoky atmosphere with little diminution of brilliancy. This dark bank is simply a dense haze, and it appears darker from the contrast with a luminous arc which rests upon it. In high northern latitudes, when the aurora covers the entire heavens, the whole sky seems filled with a dense haze; and in still higher latitudes, where the aurora is sometimes seen in the south, this dark segment is observed resting on the southern horizon and bordered by the auroral light.

Auroras are sometimes observed simultaneously over large portions of the globe. The aurora of August 28, 1859, was seen throughout more than 140 degrees of longitude, from Eastern Europe to California; and from Jamaica on the south to an unknown distance in British America on the north. The aurora of September 2, 1859, was seen at the Sandwich Islands; it was seen throughout the whole of North America and Europe: and the disturbance of the magnetic needle indicated its presence throughout all Northern Asia, although the sky was overcast, so that at many places it could not be seen. An aurora was seen at the same time in South America and New Holland. The auroras of September 25, 1841, and November 17, 1848, were almost equally extensive.

The hight of a large number of auroras has been computed, and the average result for the upper limit of the streamers is 450 miles. From a multitude of observations, it is concluded that the aurora seldom appears at an elevation less than 45 miles above the earth's surface, and that it frequently extends upward to an elevation of 500 miles. Auroral arches having a well-defined border are generally less than 100 miles in height.

Auroras are very unequally distributed over the earth's surface. They occur most frequently in the higher latitudes, and are almost unknown within the tropics. At Havana, in latitude 23 degrees, but six auroras have been recorded within a hundred years, and south of Havana auroras are still more unfrequent. As we travel northward from Cuba, auroras increase in frequency and brilliancy; they rise higher in the heavens, and oftener ascend to the zenith. Near the parallel of 40 degrees we find on an average only ten auroras annually. Near the parallel of 42 degrees the average number is twenty annually; near 45 degrees the number is forty; and near the parallel of 50 degrees it amounts to eighty annually. Between this point and the parallel of 62 degrees, auroras, during the winter, are seen almost every night. They appear high in the heavens, and as often to the south as the north. In regions further north they are seldom seen except in the south, and from this point they diminish in frequency and brilliancy as we advance toward the pole. Beyond latitude 63 degrees the average number of auroras is reduced to forty annually. Beyond latitude 67 degrees it is reduced to twenty; and near latitude 78 degrees it is reduced to ten annually.

Auroral exhibitions take place in the upper regions of the atmosphere, since they partake of the earth's rotation. All the celestial bodies have an apparent motion from east to west, arising from the rotation of the earth; but bodies belonging to the earth, including the atmosphere and the clouds which float in it, partake of the earth's rotation, so that their relative position is not affected by it. The same is true of auroral exhibitions. Whenever an auroral corona is formed, it maintains sensibly the same position in the heavens during the whole period of its continuance, although the stars meanwhile revolve at the rate of 15 degrees per hour.

The grosser part of the earth's atmosphere is limited to a moderate distance from the earth. At the hight of a little over four miles, the density of the air is only one half what it is at the earth's surface. At the hight of 50 miles the atmosphere is well-nigh inappreciable in its effect upon twilight.

The phenomena of lunar eclipses indicate an appreciable atmosphere at the hight of 66 miles. The phenomena of shooting stars indicate an atmosphere at the hight of 200 or 300 miles, while the aurora indicates that the atmosphere does not entirely cease at the hight of 500 miles. Auroral exhibitions take place, therefore, in an atmosphere of extreme rarity; so rare indeed that if, in experiments with an air pump, we could exhaust the air as completely, we should say that we had obtained a perfect vacuum.

The auroral beams are simply spaces which are illumined by the flow of electricity through the upper regions of the atmosphere. During the auroras of 1859 these beams were nearly 500 miles in length, and their lower extremities were elevated about 45 miles above the earth's surface. Their tops inclined toward the South, about 17 degrees in the neighborhood of New York, this being the position which the dipping needle there assumes.—*Professor Loomis, in Harper's Magazine.*

Protection for Silver Wares.

The loss of silver which results from the impregnation of our atmosphere with sulphur compounds, especially where gas is burned, is very great. It has been said that many thousands of pounds' worth go down our sewers annually in the form of dirt from plate cleaning, and the loss of one large house on Cornhill from this source has been described to us as serious. Silversmiths may, then, thank one of their confraternity—Herr Strolberger, of Munich—for a happy thought. He seems to have tried various plans to save his silver, if possible. He covered his goods with a clear white varnish, but found that it soon turned yellow in the window, and spoiled the look of his wares. Then he tried water-glass (solution of silicate of potash), but this did not answer. He tried some other solutions, to no purpose; but at last he hit upon the expedient of doing his goods over with a thin coating of collodion, which he finds to answer perfectly. No more loss of silver, and no longer incessant labor in keeping it clean. The plan he adopts is this: He first warms the articles to be coated, and then pays them carefully over with a thinnish collodion diluted with alcohol, using a wide soft brush for the purpose. Generally, he says, it is not advisable to do them over more than once. Silver goods, he tells us, protected in this way, have been exposed in his window more than a year, and are as bright as ever, while others unprotected have become perfectly black in a few months.—*London Mechanics' Magazine.*

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

How to Make a Wrench.

MESSRS. EDITORS:—I notice that the wrenches used in many shops are made with the lever at an angle of about 45° with the side of the nut. This requires a space of 60°, plus the width of the lever, in order to turn a square nut. If the lever made an angle of 22½° with the side of the nut it would require a space of only 45° plus the width of the lever.

I inclose a sketch showing the positions occupied by a wrench of 22½° while turning a nut a full circle. It will be seen that the wrench only requires a space of 45° plus the width of the lever.

It may be easily tried by cutting a piece of card-board to the proper shape. A. P. MASSEY.

San Francisco, Cal.

The Grindstone and its Uses.

MESSRS. EDITORS:—There is probably no implement in the machine shop or factory which pays better for the care bestowed upon it than the grindstone; and when we consider that nearly every tool, and all edge tools, require it, and before they can be used to advantage, or in fact at all, it is somewhat surprising that more attention has not been bestowed on the proper selection of the grit for the purposes intended.

The writer has visited a considerable number of machine shops lately, and found that a good grindstone, well hung, and in perfect order, was rather the exception than the rule. As grindstones in such places are almost constantly in use, their first cost is of little consequence if the quality is calculated to do the work required in the shortest time and in the most perfect manner, as more time can be lost on a poor grindstone, badly hung and out of order, than will pay for a good one every three months. This state of things should not continue, as with the great improvements made in the manner of hanging them, and the endless variety of grits to select from, every machinist and manufacturer should have a grindstone which will not only do its work perfectly, but in

the shortest time. This can be accomplished by sending a small sample of the grit wanted to the dealer to select by.

Grindstones are frequently injured through the carelessness of those having them in charge. The farmers' grindstone, from being exposed to the sun's rays, becomes so hard as to be worthless, and the frame goes to pieces from the same cause. The machinists' grindstone will have a soft place in it, caused by a part of it being allowed to stand in water over night, and the difficulty arising from this cause increases with every revolution of the stone; but as this homely implement is in charge of all the men in the shop in general, and no one in particular, and as the workmen are all too busy to raze it down, double the time is consumed in imperfectly grinding a tool than would be required to do it perfectly if the stone was kept in order by some one, whose business it should be to attend to keeping all the grindstones of the establishment in order. The wages of a man for this duty would be saved in the time and perfection with which the numerous tools of a large establishment could be kept in order for work.

J. E. Mitchell.

Philadelphia, Pa.

New Method of Constructing Induction Coils.

Messrs. Editors:—It is well known to electricians that to obtain the greatest effect from an electro-magnet with a given amount of wire, the helices should be placed at the poles of the bar. Further, that when we are desirous of producing an induced current, the best situation for the secondary helix is the middle of the magnet. The latter principle has already been applied to the construction of coils by Dr. Ferguson and others. It has been my object, in arranging my coil, to combine both these principles, and to place the various parts so as to produce the best results.

I commence the formation of the coil by inclosing the usual bundle of iron wires in a glass tube thirteen inches long, and one inch and an eighth outside diameter. The secondary wire is No. 35, silk covered, dipped before winding in paraffine. This wire is wound upon three hard-rubber bobbins, each four inches in diameter by one inch in length. Each layer is separated from its neighbor by a single thickness of paraffined paper. The primary consists of about 110 feet of cotton-covered No. 14 copper wire, and is divided into two helices, each about four inches long and containing about four layers. These primaries are placed upon either end of the iron core with the secondary helices in the middle; two empty bobbins being interposed to serve as guards to prevent the sparks from striking into the primaries. This method of construction possesses the obvious advantage of bringing the secondary wire much nearer the inducing magnet, and of course greatly enhancing the effect produced.

The instrument is inclosed in a box with the break—arranged to work either automatically or by means of a hand wheel—attached to the end. The condenser contains about seventy square feet of tin foil separated by sheets of flat-cap paper dipped in paraffine. With four Bunsen cells, seven inches high, this coil has given sparks two inches and a quarter long.

James Gallatin, Jr.

New York city.

Taps Cutting Varying Threads.

Messrs. Editors:—I noticed an article in a recent number of your paper about taps cutting varying threads, a phenomena for which I think I can offer a satisfactory solution.

Just at the time the tap begins to cut the nut, if the nut is crowded on to it faster than the pitch of the thread, the consequence will be, that instead of the cutters following each other according to the pitch of the thread on the tap, each row of cutters will be forced to take the nut at different points, and when once taken the cutters will follow the new pitch thus created, I am confident a little experiment will convince all that these views are correct.

George W. Tinsley.

Minneapolis, Minn.

[We have also received a letter from Mr. Jonas Hinkley, of Norwalk, Ohio, which essentially corroborates the above explanation.—Eds.

Fluorescence of Diamonds.

Messrs. Editors:—Having seen a communication in your issue of June 5th, upon the phosphorescence of sugar when rubbed in the dark, I take the liberty to ask whether it is generally known that a diamond will give a phosphorescent light similar to that of sugar, if gently rubbed on a white painted board in the dark. I accidentally discovered this to be the case about a year since, and have vainly sought from numerous sources some allusion to the phenomena.

Utica. S. W. C.

[It has long been known that some diamonds will become luminous in the dark by friction. Possibly the character of the exciting surface may have something to do with it, but we hardly think its color has any relation to it.—Eds.

Test of Turbine Water Wheels.

We learn that extensive arrangements for testing turbine water wheels have just been completed by the Swain Water Wheel Company, at Lowell, Mass. The power of the wheels to be tested by Emerson's Dynamometer. The amount of water used by a weir constructed after plans furnished by J. B. Francis, Engineer of the Lowell Water Power Company. The Swain wheel to be used is one that was sold before the test was decided upon, and is in no way superior to the average of the wheels furnished by that company. The test of the same wheel will take place on Wednesday, June 16th. All are invited to witness the test, and all turbine wheel builders are invited to compete; liberal arrangements will be made for doing so. For full particulars address James Emerson, Box 502, Lowell, Mass.

[Foreign Correspondence of the Scientific American.]

DIAMONDS AND DIAMOND CUTTING.

After traveling through Germany, a few weeks ago, I made a stop at Amsterdam, the interesting capital of old Holland, and had the curiosity to visit the large diamond-cutting establishments of that city, which give employment to no fewer than 10,000 men (9,000 of whom are Jews) of a total population of 279,000. The diamonds cut there amount in the aggregate to 106,000,000 francs annually. Diamond cutting is a very simple process, and, like many other mechanical operations, may, of course, be well or bunglingly executed. Holland, however, takes the lead in cutting, as Russia excels in setting the diamond.

Accompanied by my *commissaire*, I entered a special office, where I registered my name, and was then conducted to the cutting room. Here each workman had a little tin box before him, containing a collection of what looked like small crystal pebbles. On one of the crystals being taken up it was carefully examined, and the side which would make the best front then decided on. It was next secured to a handle by a piece of wax about the size of a large bullet; the wax held it sufficiently secure, and left exposed only that face which was first to be cut. Then was seen the actual "Diamond cut Diamond." The cutting diamond, which the workman held in his right hand, had a sharp edge (not always of the same shape), $\frac{1}{4}$ in. long, and was set in a handle like that of a glazier's diamond, only a little larger and stronger. This diamond is generally of the hardest quality. It was really wonderful, considering the obdurate nature of the material, how quickly the rough diamond was cut into shape. When it had a large or heavy portion which was to be removed, a small notch was cut at the place where the fragment was intended to be split off. Picking up a piece of steel about 12 inches long, $\frac{1}{4}$ inch thick, and $1\frac{3}{4}$ inches wide, one edge of which was sharp and hard and had a short bevel, the workman placed the edge in the notch, made with the cutting diamond, and striking a light blow on the back the splinter came off. These splinters are saved and worked up into small brilliants or glaziers' points. There is an art in using the cutting diamond so as not to wear it out too fast. The cutting was done lengthwise with the edge of the cutting diamond, commencing at one extremity of the face to be made on the rough diamond, cutting off little by little, as in planing cast iron. The small particles crumbled away from the diamond were saved and sifted for the polishing. When one face was cut the cement was softened, and the diamond turned around far enough to present a fresh face to be treated as the previous one, and in this way the diamond was all prepared for polishing.

I was shown a green diamond, nearly $\frac{1}{2}$ inch square, which was so hard that the ordinary diamond produced no impression upon it, and which, therefore could not be polished. If some means could be devised to finish this stone, it would be very valuable. I was surprised that the same principle of operation employed in polishing other diamonds could not be applied to this one; but I was informed that even the dust of the green diamond could not be made to polish it.

We were next conducted to the polishing room. The polishing wheels were of cast iron, about 24 inches in diameter, and ran horizontally; the polishing being performed upon the upper side of the wheel. The diamond was now embedded in lead and attached to a piece of wood, hinged at the outer end, in order that the workman may raise it to see how the work progresses and apply the polishing paste mixed with diamond dust. The polishing wheel had room for several diamonds undergoing polishing at the same time, and one man could superintend all on a wheel. I had a conversation with the workman who went to London, a year ago, to repolish the celebrated diamond belonging to the Queen of England. He finished the work so well that she made him a present of £100.

I was afterwards led to the sample room where the beautifully polished brilliants were exhibited, and also models of all the largest diamonds in the world. I saw too some specimens of pebbles cemented together containing diamonds as they are found in the mines. Most of the diamonds come from Brazil. The mines of Golconda, formerly proverbial for their wealth, are no longer worked, as they finally did not produce sufficient to pay expenses. Other mines have been abandoned for the same reason. Late accounts of diamond mines in the Orange River Settlements, in South Africa, point out fresh fields for the diamond adventurer. The papers announce that there is one from this territory on the way to Europe valued at £32,000. The discovery of these mines was, as in most other cases, accidental, while searching for gold. It is said that diamonds were first found in Brazil by the natives, when examining the sands washed down from the mountains for grains of gold. The glittering crystals were laid aside as curiosities. A disinterested miner, whose name does not appear on record, arrived from Europe, saw their value, and, instead of quietly buying them up, instructed the people as to the nature of the discovery.

The history of diamonds and diamond hunting is one of great interest. A full account of the diamonds of which I saw models would fill a large volume; but I may give a brief notice of some of the most remarkable. That treasure once the property of the Great Mogul, the *Koh-i-noor*, weighed before cutting 600 carats, and was valued at three quarters of a million sterling. It is now the property of the British Crown and is estimated at £2,000,000. A suspicious Brazilian diamond, which weighed 1,680 carats when rough, belongs to the King of Portugal, and is considered worth £3,044,800. It has been insinuated that it is only a mass of very fine white colored topaz. But imagine a poor diamond hunter going out before breakfast and returning to his tent with a king's ransom—a richer man by about $20,000,000. The finder is not always aware, however, of the value of his discovery. This is well illustrated in the case of the *Cape Koh-i-noor*. We read that it was purchased from a native doctor by a Dutchman, who gave 500 sheep and a few head of cattle for it. The doctor no doubt thought himself a made man when he received so much for the stone; but the trader brought it to the nearest town and there sold it for £11,200; and that again is but about a third of what it is now set down at. The *Regent* or *Pitt* diamond, found in the East, was purchased from a native for £20,400. The Governor of Madras, sold it in 1717, to the Duke of Orleans for £130,000. This jewel, Napoleon placed in the hilt of his sword of state, and it is considered to be the finest and most perfect diamond known. Another well-known diamond, now a part of the Austrian crown jewels, was purchased for a few pence at a stall in a market place in Florence; the vender believing he had to do with merely a bit of rock crystal. Its present value is £153,600. The one which now ornaments the scepter of the Emperor of Russia, is as large as a pigeon's egg, and is said to have been once, the eye of a Hindoo idol. A deserter from the French service got himself installed by a priest in the heathen temple where the idol stood, and made off with it at the earliest opportunity. The Empress Catherine purchased it for £90,000 and £4,000 annuity. Many stories of this kind are told, and of wars and bloodshed for the possession of these coveted jewels.

J. E. Emerson.

For the Scientific American.

TO WASH FLEECE WOOL.

BY DR. REIMANN.

The washing of wool has always been attended with great inconvenience. The use of decomposing urine has been from time to time replaced by other more convenient methods, but invariably with more or less failure. Some of the methods proposed to supersede the old one were too costly; others again, attacked the fibers of the wool, so that the manufacturer is still obliged to employ the above inconvenient agent.

Notwithstanding a method of washing wool had been discovered so long ago as 1846, which answered every purpose, but, as is often the case, did not meet with due consideration because not published with much noise.

This process is known and advantageously used in a few manufactories, but as a general rule, the manufacturer is still on the lookout for a more convenient method, without any knowledge of the process discovered so long ago. Perhaps it will be rendering a service to these manufacturers if this method is once more published.

As regards the greater number of wools, especially those wools employed in the manufacture of carpets, a single washing with cold water is sufficient to render them fit for all the succeeding operations of oiling, carding, and spinning. But other kinds of wool, such as the Saxon, the finer North and South American which contain a great deal of oil or fat, and the Scottish wool with long hairs, cannot be perfectly cleaned in this way.

The methods of washing fleece wool known until 1848, consisted in treating the wool with soap, or with decomposing urine, or with a mixture of the two. In a few cases the wool was treated with a tepid solution of common salt.

As already stated above, the method with urine is almost invariably resorted to by cloth manufacturers at the present day. Without enlarging upon the extremely disagreeable character of this operation, there is obviously great difficulty in procuring the necessarily large quantity of urine. Moreover the urine is not precisely the same in summer and in winter, so that the result of the washing is not the same at all seasons. These are some of the more important reasons why manufacturers are still wishing to replace the urine by some more convenient agent, unconscious of the fact above mentioned; namely, that a process was discovered twenty years ago which would have advantageously replaced the present inconvenient method.

The discoverer was Herr Schlieper. This chemist was in the years 1843 to 1852, superintendent of one of the largest carpet factories in America. Here it was necessary that some cheaper and more convenient method of washing wool should be resorted to. At first he tried the alkalies. There were great difficulties, however, in their employment, as the quality of the wool was easily impaired. When carbonate of soda was employed, at a slight elevation of temperature, the wool matted together, became rough, and sometimes turned yellow. The general results of his experiments were as follows: Liquid or caustic ammonia and carbonate of ammonia, are the only alkalies which do not injure the wool even at a somewhat high temperature. Having on one occasion to wash a large quantity of wool which had been damaged by sea-water, his attention was drawn to the effect of common salt upon the wool. After this he employed, with better success than with carbonate of soda alone, a mixture of this with common salt. The results thus obtained did not, however, yet entirely satisfy him. At last, after many trials, he discovered that the addition of hydrochlorate of ammonia had an admirable effect upon the wool. The carbonate of soda alone used to have a bad effect. He found out, moreover, that the employment of olein was very advantageous, nor was it a matter of indifference whether olein or simply soap was employed.

Thus, after a series of discoveries, Herr Schlieper was enabled to prepare a mixture which was well adapted for the washing of fleece wool and at the same time had no injurious influence upon it.

The new washing mixture may be obtained by mixing carbonate of soda, hydrochlorate of ammonia, and olein. The proportions found to be most suitable are as follows: Powdered carbonate of soda, 20 parts; powdered hydrochlorate of ammonia, 9 or 10 parts; olein, 9 parts. The amount of hy-

drochlorate of ammonia required is dependent on the quality of the wool which has to be washed. The finer the quality of the wool the greater the amount of hydrochlorate required.

As regards the individual effect of the several constituents of the washing mixture, it is found that, on mixing the different salts, chemical compounds are formed, which are highly advantageous in washing. From the mixture of carbonate of soda and hydrochlorate of ammonia carbonate of ammonia results. The soda of the carbonate is transformed into common salt (chloride of sodium). The olein combines with a portion of the soda, and is converted into oleate of soda or soda soap, and a corresponding amount of bicarbonate of soda is formed. This is the reason why it is not a matter of indifference whether olein or common soap is employed. The bicarbonate of soda thus formed serves with the bicarbonate of ammonia to prevent the carbonate of soda from exerting any injurious influence upon the wool. Hence, manufacturers may employ carbonate of soda, the cheapest alkali for washing wool. In this operation the olein facilitates the production of an emulsion with the fat of the wool. The addition of olein is, therefore, a matter of some importance. Herr Schlieper always found that the washing was incomplete without olein. The small quantity of common salt produced by mixing hydrochlorate of ammonia and carbonate of soda, seems also to have some influence, since experiments with the carbonates of soda and ammonia alone did not give the same result. A small quantity of decomposing urine might be used instead of the ammonia, the results in either case being almost the same. The temperature employed in washing is of considerable importance. It depends upon the quality of the wool and the quantity of hydrochlorate of ammonia employed. It can only be found out by practice. Even slight elevations of temperature have very considerable influence in the process of washing. For instance, the wool bears well a temperature of 122° Fah., but is altered at 129° Fah. Another kind of wool withstands a temperature of 115° Fah., but is damaged at 122° Fah.; a third has a different maximum temperature, and so on.

It is therefore obvious that an excellent result may be insured if the mixture is only properly prepared and the process properly carried out. A considerable experience has not only established this fact, but has proved, also, that there is a considerable economy in employing the above method.

How, then, has it happened that this method of washing with its great advantages has been so little employed? Probably the chief reason is that manufacturers dislike the trouble involved in making further trials to find out a washing mixture more suitable than the urine which they now employ.

The author of this paper would be well satisfied if his remarks should induce some manufacturers to try the method described above. When it is once introduced and universally employed, washing wool will no longer be the difficult and expensive process it is in the present day.

UNDERGROUND LIFE.

By L. Simonin.

A visit to a coal mine is always extremely interesting, and even exciting, to a novice. The underground workings are reached by the shaft; in a bucket suspended from a rope in some collieries, but on a well-arranged platform with a cage and shield overhead, the whole traveling in guides, in others. An unpleasant feeling is experienced at starting, in the sensation of vacancy which the going down a shaft always produces. The bucket rubs against the walls; the space is narrow, and appears still more so than it really is, on account of the darkness. It is but dimly lighted by the lamps. Water filters through the rock drop by drop, in a fine rain, and now and then the thought occurs that a stone might fall from the wall and smash your head; that the rope, stretched by the weight it supports, and whose oscillations are perceptible, may also break, or the bottom of the bucket come out. In the middle of the shaft the thought occurs of a collision, or of a possible entanglement; but when the obstacle is escaped you breathe more freely, and soon reach your journey's end, happy to have escaped with so little trouble. Visitors sometimes decline to go down the mine in this way, while others cower down at the bottom of the bucket, where they remain motionless through fear, and on reaching the bottom it is actually necessary to turn the bucket over to get them out, and they only recover their senses with difficulty. The miners, on the contrary, make this journey twice every day without a thought of danger; and they laugh and talk in going down, just as an old soldier goes under fire without shrinking, and gaily faces the shower of grape-shot.

Two or three times every four-and-twenty hours, but usually twice, morning and evening, the fresh turn of hands enters the mine. The sight is a curious one; the men press forward in a body; then, at the sound of the bell, they disappear in crowded groups in the tubs and cages, or down the ladders. They are heard talking on first leaving; but the sound of their voices is soon lost in the shafts, until it becomes merely a hoarse murmur, and only the pale glimmer of their lights is distinguishable.

Prayers are offered up in some Continental mines by the miners before going down; in most mines, however, this is neglected. When they arrive at the bottom of the shaft they separate, and every one goes to his place of work.

In the stalls and working-places where the noise is heard, and where the smell of gunpowder is perceptible, the miners are getting the coal; in the levels the milley-boys and horses are crowded together, and trains go and come; at the bottom of the shaft it is the noise made in hooking on or unhooking tubs which is heard, and the shouts of the hookers-on to the landers at the pit-mouth. The lamps only shine at certain points, lighting up the faces of the men, the shape of the waggons, and the coal which glistens here and there; the rest is cast in shadow, and yet the whole effect is animated and startling.

The galleries cross each other in all directions, like the streets of a town with many turnings. There are cross-roads and squares; each road has its name and destination, but as there are no sign-posts, a stranger loses his way at first, soon finding it, however, by practice. Some of the galleries, which are long, wide, and well ventilated, form the principal thoroughfares and great streets, constituting the fine quarter of the mine. The others, which are sometimes low, narrow, tortuous, ill supplied with air, kept in bad repair, and liable beside to be only in temporary use, are like the old quarters, which will soon have to disappear. This underground town is inhabited night and day; it is lighted, but with lamps. It has railways, traversed by horses and locomotives. It has streams, canals, and fountains—strong springs of water which, in truth, could be very well dispensed with. There are even certain plants and living creatures which are peculiar to it; and life, as has been said, seems to assume special forms in it. It is the black and deep city, the city of coal, and the lively center of labor. The inhabitants only live in it part of the day or night to do their work; and the crews or shifts relieve each other two or three times in the course of the four-and-twenty hours. There are not, as might be supposed, either promenades, shops, or houses, and still less resident miners who never see daylight again when they have once entered the works. The horses only, in some districts, never leave the mine.

Some authors have spoken of men who spend all their lives underground, who are born and die there, painfully subjected to the labors of the Troglodytes. There are two mines in particular on which the imagination delights to brood—those of Wielliczka and Bochnia, in Austrian Gallicia, where they do not work coal, but a rich mass of rock-salt. At the intersection of the galleries the miners have carved out of the solid rock obelisks, columns, statues, and even a chapel. There was no need to pretend that there were in these salt mines houses several stories high, bazars, theaters, coffee-houses, hotels, springs and streams of fresh water, and even a windmill! It has been stated that the miners never left these dismal abodes, that they were born and d'e l there. All that is pure fiction. It is not the less true that a large mine in active work resembles in some respects in appearance, and by the animation which prevails in the working-places and the levels, an actual town.

The dangers to life in coal mines are varied and numerous, as every Briton well knows. One of the most fatal is fire-damp; but on this we need not here enlarge. In some collieries it used to be the custom, before the safety-lamp was invented, to light the fire-damp every night. The time is still remembered at Rive-de-Gier, in France, when a man came every evening to set fire to the gas in the mine—to provoke the explosion, in order that the working stalls should be accessible again the next day. Wrapped in a covering of wool or leather, the face protected by a mask, and the head enveloped in a hood like a monk's cowl, he crawled on the ground before firing the explosive mixture, to keep himself as much as possible in the layer of respirable air; for the fire-damp, being lighter than the atmosphere, always ascends to the upper parts of the levels. In one hand he held a long stick, with a lighted candle fixed at the end of it, and he went alone, lost in this poisoned maze, causing explosions by advancing his lamp, and thus decomposing the noxious gas. Having fired any mixture of fire-damp, he naturally changed his position and walked upright, since the carbonic acid produced by the explosion rapidly formed the lowest layer of air. He was called the *penitent*, on account of the resemblance of his dress to that of certain religious orders in the Roman Catholic Church. In other mines this brave collier was called the *cannonier*. When the fire-damp killed him on the spot, it was said that the cannonier died at his post on the field of honor, and that was all his funeral oration. The same person in English mines bore the expressive name of *fireman*.

Coal mines are liable to take fire and burn even for years. The ignition of the coal, especially in Staffordshire, England, where, from the peculiar nature of the coal combustion, is not uncommon, has produced surprising effects of alteration in the measures containing the coal. The sandstones have become vitrified, baked, and dilated by the fire, the banks of plastic clay hardened and changed nearly into porcelain.

In the environs of Dudley there was formerly a coal mine on fire. The snow melted in the gardens as soon as it touched the ground. They gathered three crops in a year, even tropical plants were cultivated, and, as in the Isle of Calypso, an eternal spring prevailed. It is by somewhat similar means that early fruit and vegetables are grown in the depth of winter in some of the gardens round Paris, where the temperature of the soil and the surrounding air is artificially raised by means of currents of hot water made to circulate in pipes underground.

In another Staffordshire colliery, the firing of which dates many years back, and which is called by the inhabitants *Burning Hill*, it was noticed, as at Dudley, that the snow melted on reaching the ground, and that the grass in the meadows was always green. The people of the country conceived the idea of establishing a school of horticulture on the spot. They imported colonial plants at a heavy expense, and cultivated them in this kind of open air conservatory. One fine day the fire went out, the soil gradually resumed its usual temperature, the tropical plants died, and the school of horticulture was under the necessity of transferring their gardens elsewhere.

Subterranean ignitions generally only trouble the miner by the mephitic vapors which they give out, and the high temperature which they cause in the stalls.

Falls of ground may be ranked among the greatest perils which the miner has to guard against. If the shock be direct, the man is crushed on the spot, or if he escape, it is at the cost of a limb. Masses of rock from the roof, bell molds, as lumps of ironstone are called in the figurative language of the colliers, sometimes become suddenly detached without the least warning, from the shales or friable coal forming the roof. These lumps, frequently of great size, falling on the head of the miner, often kills him outright.

In other cases, the wallings and timberings give way under the enormous pressure of the ground.

The danger of underground inundations is as formidable as that of falls of ground. The water accumulates in the mine, in a body, in basins, in actual lakes. The miner keeps it there by dams made of cement or clay—by wooden framework, the different pieces of which are geometrically put together like the stones of a wall or a vault. Equally cleverly devised masonry has been built up in the shafts; and yet the pressure of the water is sometimes so great as to overcome all these obstacles. An old English collier, who believed the earth was alive, compared the veins met with in mines to the veins and arteries of the human body.

It is remarkable that in the confined and sunless atmosphere in which the coal miner lives half his time, he contracts few special maladies; nevertheless, in the course of time the bad air impoverishes his blood and causes anemia, while the dust arising from the coal produces dangerous affections of the chest and lungs. On the other hand, the miner is sheltered from the inclemency of the weather, from cold, wind, and rain, and is more favored in this respect than the out-door laborer. He has, nevertheless, to be careful not to take cold on leaving the mine, and to observe certain precautions when he has to work in water.—*The London Builder*.

Pocket Paper.

The Japanese dignitaries, says the Boston *Journal of Chemistry*, who recently visited this country under the direction of Mr. Burlingame, were observed to use pocket paper instead of pocket handkerchiefs, whenever they had occasion to remove perspiration from the forehead, or "blow the nose." The same piece is never used twice, but is thrown away after it is first taken in hand. We should suppose in time of general catarrh, the whole empire of Japan would be covered with bits of paper blowing about. The paper is quite peculiar, being soft, thin, and very tough. The Japanese use paper for a great variety of purposes. A recent traveler states that he saw it made into materials so closely resembling Russian and Morocco leather and pig-skin, that it was very difficult to detect the difference. With the aid of peculiar varnish and skillful painting, paper made excellent trunks, tobacco-bags, cigar-cases, saddles, telescope-cases, the frames of microscopes; and he even saw and used excellent water-proof coats, made of simple paper, which did keep out the rain, and were as supple as the best india-rubber. The Japanese use neither silk nor cotton handkerchiefs, towels, nor dusters; paper, in their hands, serves as an excellent substitute. It is soft, thin, tough, of a pale-yellowish color, very plentiful, and very cheap. The inner walls of many a Japanese apartment are formed of paper, being nothing more than painted screens; their windows are covered with a fine, translucent description of the same material. It enters largely into the manufacture of nearly everything in a Japanese household; and he saw what seemed to be balls of twine, but which were nothing but long shreds of tough paper rolled up. If a shopkeeper had a parcel to tie up, he would take a strip of paper, roll it quickly between his hands, and use it for the purpose; and it was quite as strong as the ordinary string used at home. In short, without paper, all Japan would come to a dead lock; and, indeed, lest by the arbitrary exercise of his authority, a tyrannical husband should stop his wife's paper, the sage Japanese mothers-in-law invariably stipulate in the marriage settlement, that the bride is to have allowed to her a certain quantity of paper.

National Exhibition of the American Institute.

The American Institute will hold its thirty-eighth Exhibition in the new building, corner of Third Avenue and Sixty third street, opening for the reception of goods, September 1, 1869, and closing the 30th of October.

The wool industry is to be made a prominent feature of this exhibition.

It would be entirely superfluous on our part to say anything in favor of these exhibitions. Their reputation is world-wide. No better representation of the progress of the country in arts and manufactures can be given than they always afford, and each successive exhibition increases the number of contributors and the interest of the exhibition.

Letters relating to the exhibition should be addressed to "Prof. S. D. Tillman, Corresponding Secretary, American Institute, New York," who will send blanks and give any desired information to parties intending to become exhibitors; he will receive and file all applications for space.

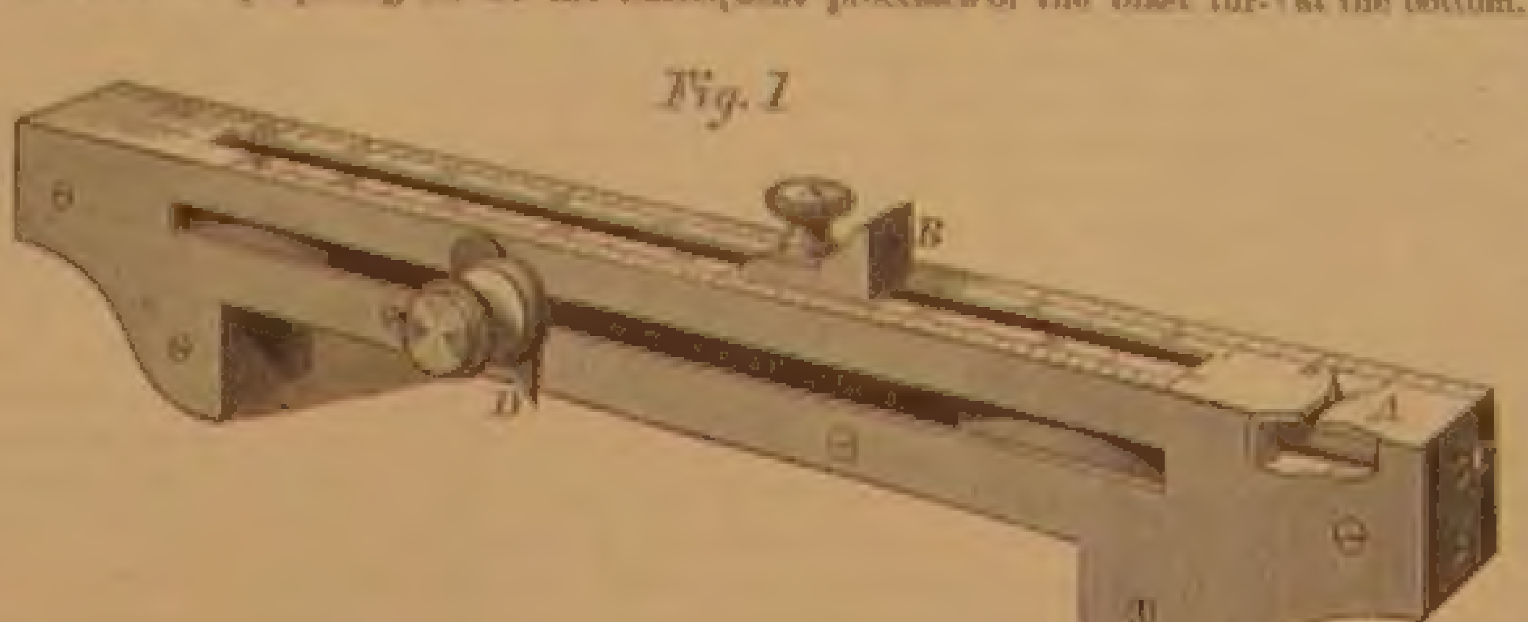
The Suez Canal appears likely to produce a radical change in the climate of the surrounding country. From a series of meteorological observations made during two years at three stations on the Isthmus, we are led to infer the interesting fact that introduction of the waters of the Mediterranean into the lakes has caused an atmospheric moisture in places heretofore noted for their dryness, to such an extent that fogs, equal in intensity to those of some European cities, now occur. This appears to support an important conclusion of Colonel Foster, in his recently published work, with regard to the effect that irrigation would have on our Western deserts.

Improved Weather-Board Hook.

Our engravings exhibit the form and details of Nester's combined carpenters tool for weather-boarding. The form of the hook is well shown in both Figs. 1 and 2. This tool is made of mahogany or rosewood, covered on three sides with smooth brass plates. It is twelve inches long by one inch in thickness.

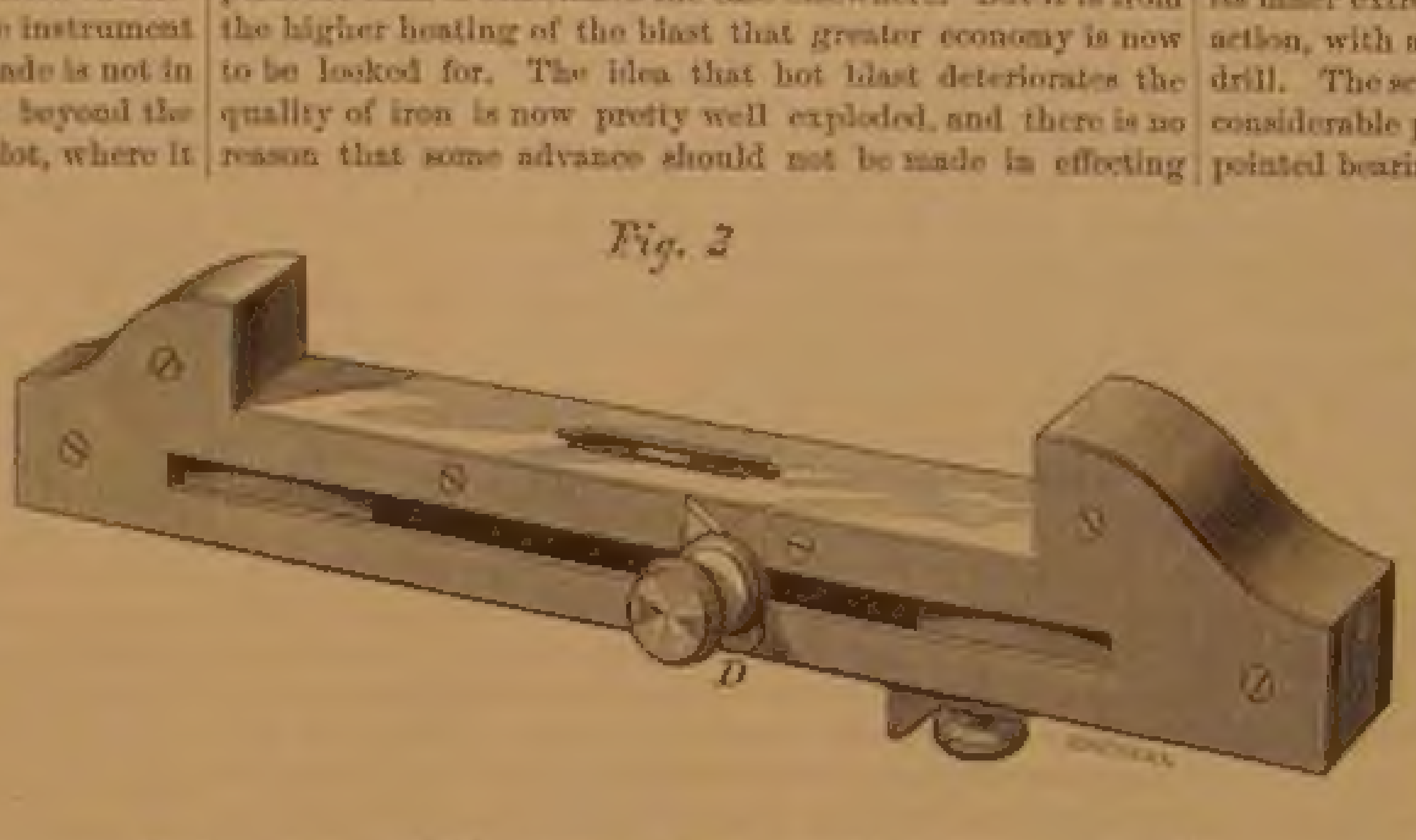
The plate on the side opposite the shoulders of the hook has two scales, as shown in Fig. 1, one extending from end to end of the tool and constituting a common foot rule. The other extends from the spur, A, to a distance of nine inches on that part of the plate separated from the foot scale, by the longitudinal slot in which plays the slide, B. The slide, B, is held to its place by a milled set screw when adjusted as desired. The spur, A, is attached to a pivot shown in Fig. 1 where a portion of the plate is broken away. A groove is cut in the end of the pivot at C, to admit the point of a screw driver, by means of which the pivot may be made to make a quarter revolution, thus throwing the point of the spur below the plate. The slide, B, is easily removed so that when the spur is turned out of the way the instrument may be used as an ordinary level. When employed for weather-boarding the slide, B, is used in connection with the spur, A, to indicate distance between the several boards, and forms a very neat and perfect working gage, capable of being set to distances between one inch and nine inches including fractions of an inch. The convenience of this feature will be apparent to every practical carpenter.

Fig. 1



NESTER'S WEATHER-BOARD HOOK.

Fig. 2



In the side plate of the tool is cut a second longitudinal slot of the same length as the one described above, in which plays a second slide, D, Figs. 1 and 2, which carries a blade having a V-shaped point, held to its place by a milled thumb-nut, and used to mark across the board when the instrument is employed in weather-boarding. When the blade is not in use its point may be turned so as not to project beyond the edge of the plate and slid to either end of the slot, where it is held by a spring until it is needed. The edges of the blade being ground beveling on the outside and flat on the side next the plate, are thus shielded from receiving damage. The point of the V-shaped knife when in use,passes by the center of the pivot when slid in either direction, thus giving a smooth cutting stroke instead of a scratch, as would be the case if the point were drawn perpendicularly to the surface of the wood. The slot in which the slide, D, plays, is made wider than the pivot, so that the knife may readily reach the bottom of any depression in the weather-board caused by warping or winding of the boards. The slide, D, also plays so easily in the slot that it readily drops to either end, when the instrument is held vertically, and is held there by one or the other of the springs above described. In use it is always left at the end of the slot when after marking a board the hand leaves the thumb-nut. The method of grinding the blade insures accuracy in the line, as the cutting edge is thus brought into intimate contact with the straight edge of the plate.

Midway between the shoulders of the hook is placed a spirit level, which adds to the availability of the tool. A straight line joining the outside angles of the shoulders lies exactly parallel to the plane of the back of the instrument. By applying these angles to the lower edge of a weather-board the workman ascertains by a single glance at the bubble whether the board is horizontal or not, employing less than one tenth the time occupied in making the same test by a square and plumb-line.

Placing this tool in his belt or apron, the workman can step upon the staging with no other implements except a saw and a hammer, and proceed rapidly with his work unencumbered by the usual kit of implements. The inventor claims that this implement will pay for itself in one week by the saving of time effected in its use; and is confident that any carpenter using the tool for that time would never thereafter be content to use the old style of hook. As an evidence of the favor it is meeting with, we are informed that the company engaged in its manufacture have recently received a single order for these improved hooks, amounting to fifty thousand dollars.

This tool was patented by John Nester, of this city, December 31, 1867, and additional improvements have been made for which a patent is now pending. Orders addressed to the Patent Weather-board Hook Company, 27 Park Row, New York, will receive prompt attention.

Paddle vs. Screw.

A striking instance of the proper distribution of steam power has been exemplified in a steamer recently altered at the port of Greenock. The vessel in question was a paddle steamer of 350 horse power, with cargo space for 400 tuns of goods. Her consumption of fuel was 24 tuns a day and her speed 7½ knots. She was converted into a screw steamer, and fitted with a twin propeller, and the consequence has been that with engines of 75 horse power she steams at the rate of 10½ knots, and carries 800 tuns of cargo, with a daily consumption of about 8 tuns of coal only.—*The London Artizan.*

Economy Wanted in Smelting Iron.

At a recent meeting of the Chemical Society, of London, Mr. Bell, an iron master, directed attention to economy of fuel in smelting iron. When it is considered that something like 2½ tuns of coal are consumed in producing 1 tun of pig iron, even when hot blast is used, and that to effect the chemical change of smelting, only 8 cwts. of coal are needed, still leaving one half of the heating power of that coal unapplied and available for further use, the great importance of devising means of economising fuel in this operation will be obvious. More than four fifths of the coal consumed in producing pig iron is consumed in raising the temperature of the charge to effect fusion, and that is done under the most disadvantageous circumstances as regards production of heat.

The gases escaping from the throat of a blast furnace have not only a large amount of unused heat-generating power, but they have also a temperature and reducing power capable of preparing ore for the subsequent processes of the blast furnace. In the Cleveland district economy in this direction has been carried to a considerable extent by increasing the hight of the furnace, and thus taking off the gas at a lower temperature than is sometimes the case elsewhere. But it is from the higher heating of the blast that greater economy is now to be looked for. The idea that hot blast deteriorates the quality of iron is now pretty well exploded, and there is no reason that some advance should not be made in effecting economy of fuel by this means. Dr. Paul has shown the great influence of hot-blast in reducing the consumption of fuel per tun of iron made; and the subject is one well worth the consideration of ironmasters, especially at the present time, when we are so hardly pressed by foreign competition in the production of cheap iron.

MILLER'S PATENT DRILL.

A want has long been felt for a small portable drilling machine, that could be attached readily and securely to a bench

or laboratory table, for jeweler's use, and for any other purpose where a small hand drill is desirable. The tool, which is herewith illustrated, seems every way adapted to supply this want, and is as elegant in design as efficient in use. It is shown in the engraving as attached to a bench by means of a hand screw, after the old method of affixing small vises, etc.

The letter A, in the illustration, represents a circular table, upon which the object to be drilled is placed and held by the fingers or pliers. The left fore arm rests upon the crutch at the top of a bent lever, B, pivoted at C, to a curved support, D. This supporting arm, which forms a fulcrum for B is attached to a vertical sleeve which passes through a collar at E, and is held to its place by a set screw. This arrangement admits of raising or lowering the sleeve and its attachments or changing its position laterally, as occasion may require. Through this sleeve a sliding rod plays, to the top of which the table A is attached, the lever, B, working in the slot at the bottom. The crutch, K, has a horizontal rotation on its bearing. This arrangement of parts permits of adjustment of the table to any required hight by the left arm, while the piece to be drilled is held by the left hand, leaving the right hand free to revolve the drill.

The revolution of the drill is accomplished by means of a screw thread on the arbor,which revolves inside a fixed vertical sleeve extending from G to L. On this sleeve, another sleeve, F, slides up and down, having a handle pivoted to it. From the lower side of this handle, close to the sliding sleeve, a short stud projects. In the lower end of this stud is a small slot, through which a pin passes, the pin also passing through a hole in the sliding sleeve, and also through a longitudinal slot in the inner sleeve. The elevation or depression of the handle causes this pin to be partially drawn out or thrust into the interior of the inner sleeve. This motion is limited by a small adjustable screw passing through a smooth hole in the stud just above the pin. The pin is filed flat at its inner extremity. This end engages, when the drill is in action, with a four-threaded screw on the live arbor of the drill. The screw thread has an abrupt pitch, sufficient to give considerable power to the drill. The drill arbor turns on a pointed bearing at G, and is supported by a collar at L. Below the latter bearing, a fly wheel is attached to the drill arbor, and directly below the fly wheel is shown the chuck, J, which may be of any convenient form, and is screwed to the arbor in the usual way.

The operation of this drill is as follows: The drill having been adjusted, and the piece to be drilled being held by the left hand, and brought up to the point of the drill by bearing with the left arm on the crutch, K, the operator grasps the handle at F with the right hand and raises it. This disengages the inner end of the pin—above described as being attached to the stud projecting from the lower part of the handle at F—from the screw thread. As soon as this is done, the set screw, which limits this movement and which fits into the sliding sleeve to which the handle is pivoted, transmits the motion of the hand to the sliding sleeve and raises it to the top of the slot in the inner sleeve. The depression of the handle now thrusts the pin into the interior of the inner sleeve, where it immediately engages with one of the four threads of the screw, which, retreating from the pressure on its upper surface, gives a rapid and smooth rotation to the drill arbor, which rotation is maintained during the next elevation of the handle, by the fly wheel. The under sides of the screw threads are beveled off, while the upper surfaces are square with the vertical axis of the arbor. The pin in raising the handle is entirely disengaged from the screw threads, so that there is no rattling. The stillness of the machine in working is one of its most attractive features. Rubber washers are placed so as to receive the force of the outside sleeve at the ends of the stroke, and the arrangement of the parts is such as to reduce friction to a minimum quantity.

The whole forms one of the neatest and most convenient table tools we have seen. It is obvious that the method of obtaining rotation is equally applicable to bit stocks and other similar tools. A patent for this improvement was granted through the Scientific American Patent Agency, to Charles Miller, May 26, 1868, and by him assigned to Messrs. S. M. Spencer & Co., Brattleboro, Vt., to whom all letters should be addressed.

Safety Nitro-Glycerin.

We learn from the *London Mining Journal* that a series of interesting experiments for protecting nitro-glycerin were recently made at the Manorfield House. A small quantity of the material was put into a basin, and hot water was poured upon it, the result being that in two minutes the original oil sunk to the bottom, and (the surplus water being poured off) was run into a small phial ready for use. Into this the fuse (pointed with a percussion cap) was inserted, and fired, and the loud explosion testified to the unimpaired force of the nitro-glycerin thus recovered. It is obvious that by this invention, this highly dangerous but very useful compound can be conveyed by rail or ship, and be stored with perfect safety, and that it may be "recovered" in small quantities on the very spot where it is required for use, so as to avoid, in a great measure, the peril to miners or others who have to handle it in their operations.

A British parliamentary paper has been published, which shows the number of cotton, woolen, shoddy, worsted, flax-hemp, and other factories subject to the Factories Act in each county of the United Kingdom, and giving many other minutiæ respecting factories. In the whole kingdom there are 6,408 factories, in which 854,243 persons are employed.

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Contents:

(Illustrated articles are marked with an asterisk.)

WASTE.

The great struggle which now engages the attention of the entire civilized world is economy in production. How to make the same number of acres support an accumulated population; how to make vegetable productions, hitherto regarded as useless, add to the stock of food or clothing; how to make fewer bushels of coal perform the world's work—are some of the most important questions now under consideration by the scientific world. To these may be added the constant endeavor to utilize fragmentary materials, to gather up pieces and remnants, new and old, and make them continue to do duty in the service of mankind.

But while the world, as a whole, is devoted to the study of economy, personal waste and extravagance seem daily increasing, so that it is questionable whether the majority of mankind have fewer necessities now than when the arts were imperfectly developed and science had not begun to exist.

Many things are now necessities that formerly were not even desired. We have forgotten who it was that used to remark to his family when a new article of diet appeared on the table, "Now we are about to create a want." But the remark embodies a sound principle of social philosophy. Most of our wants are artificial creations, but modern society is artificial also, and we may as well doubt the advantages of civilization, as compared with barbarism, as to assert that the accessories of civilization are not necessities of the age.

Now what we wish to show, clearly, is that the cheapening of products by economical methods of manufacture, the increased production of food by the superior methods of modern agriculture and the utilization of waste products, are the very means by which the general diffusion of the luxuries of modern civilization is made possible. The entire inventive genius of this and European nations is concentrated upon the economical appropriation of time for traveling, sending of messages and processes in the arts, and the increase of machinery which shall not only save time and labor, but also material. In other words, the aim is to shorten as much as possible all those transactions which are simply utilitarian, or intermediate between the rough crude materials of nature and the enjoyments afforded by them in their modified and improved forms.

As a nation we have not excelled in the fine arts; we are not yet old enough for that. Our efforts have perforce been directed to subduing the vast wilderness which a century since covered nearly the entire continent. We have had to develop our mineral products and to accumulate wealth, to settle momentous political issues, and to establish a permanent commonwealth.

In the struggle for material supremacy we have been very successful, but there yet remains much to be done, enough to occupy the attention of inventors, engineers, and scientific men for a century to come. Meanwhile we are constantly "creating wants" at a rate that bids fair to outstrip the supply. Liberality and even profuseness in personal expenditure, are on the increase. We want rich and higher-priced clothing and furniture, luxurious diet, more splendid habitations, and increase of all the accessories of refined life. In the increase of personal expenditures we see signs of future trouble for this country. If the production of all the things we use, or a large proportion of them, was domestic, there would at present be no cause for apprehension, but we are sending away our gold and our surplus food, as fast almost as they can be got out of the earth, to foreign countries, for which we obtain a large proportion of the tinsel and gewgaws, which have become—though in their nature essentially luxuries—necessities to us. Could we be at once and wholly debarred from the use of such things we should soon learn to do without them, and they would cease to seem desirable to us; but we do not quarrel with the taste that demands them, it is the natural outgrowth of increasing civilization.

What we object to is the purchase of such things from abroad. If it be an admitted fact that they must be had from some source, we ought to make them for ourselves. There is now room for the introduction into this country of many of the lighter branches of industry, profitably carried on in other lands, and the products of which constitute the largest proportion of the exports of France, toward which nation a constant stream of gold flows from this continent.

The main difficulty is that in products of this kind, where material counts small and labor foots up large, the cheap labor of Europe gives great advantage to foreign producers. We believe the remedy for this is in the hands of our Government, and is that "protection" against which such an outcry is just now being made. But we have already expressed our views fully on that subject.

It would seem, then, that the tendency of modern civilization is to economy in cultivation of the soil, in means of transit, in time and labor applied to industrial pursuits, in the motive forces upon which man depends for the performance of work, and in processes which transform crude materials into useful products. While personal requirements increase, and when a product is cheapened by an improvement, there are more who want it, and more labor is demanded in its production. And it is further evident that while more labor is demanded to supply the wants of the world at large, each individual of the mass has greater scope for the enjoyment of the products of that labor. It is hard to predict where this will end; that its present tendency is to elevate labor no one can doubt.

THE DARWINIAN THEORY.

This celebrated theory is making proselytes rapidly. In fact, it may be said that its advocates no longer admit that it is simply a theory, but hold it to be demonstrated by the scientific researches it has called forth.

The theory has secured a most powerful ally in Dr. Fritz Müller, who as physiologist, anatomist, and shrewd observer of natural phenomena scarcely ranks as an inferior to Darwin himself. That our readers may understand the additional strength the Darwinian system has received by the adhesion of Dr. Müller, we will briefly rehearse the prominent features of the theory as maintained by its numerous disciples.

This theory maintains that the origin of species is attributable to the transmutation of a certain original type or types of living beings, by descent with gradual modifications, attributable to the natural selection of progenitors having certain peculiarities, which give them the power of impressing upon offspring the same peculiarities that the parents possess but in a greater degree; and that these peculiarities finally reach such a point that the individuals possessing them form a distinct species from their first progenitors.

The method adopted by Darwin to demonstrate the truth of this theory, was as simple as it has proved incontrovertible. He undertook to produce species by a process of artificial selection of individuals of kinds of animals which reproduce very rapidly, such as rabbits, pigeons, etc., and found that, by pairing such as exhibited slight variations of form, and selecting from their offspring such as exhibited in the most marked manner the same peculiarities, after a time he obtained so wide variations from the original type that the animals thus obtained might be properly considered as belonging to a distinct species.

Among the most prominent scientific men who have fully embraced this theory is the veteran Sir Charles Lyell whose past record does not indicate a man likely to be led to hasty conclusions, or apt to adopt any theory unsupported by ample evidence of its truth. This celebrated scientist commenced his geological researches with no bias toward any theory and after impartial and candid investigation came out a Darwinian.

In like manner Dr. Müller, set himself to work to devise some test by which he might demonstrate the truth or falsity of the Darwinian system. Having decided that the Crustacea afforded a favorable field for observation, he proceeded to South America for the purpose of gaining facilities for observation and study. We can not, of course follow Dr. Müller through all the laborious researches, which he has recorded in his "Facts and Arguments for Darwin," or give in detail the important facts and discoveries which have rewarded his investigations, but the conclusion he arrives at is, that the facts he has observed afford a most striking confirmation of Darwin's views.

Conceding the truth of Darwin's theory, an interesting question arises as to which of the known species is the least removed from the original type or types. Probably this question cannot at present be definitely answered, but Dr. Müller remarks that "the primitive history of a species will be preserved in its developmental history the more perfectly, the longer the series of young states through which it passes by uniform steps; and the more truly, the less the mode of life of the young departs from that of the adults, and the less the peculiarities of the individual young states can be conceived as transferred back from later ones in previous periods of life, or as independently acquired."

THE Royal Geographical Society, of England, has bestowed one of its highest honors upon Mrs. Somerville, whose work on physical geography is the best we have on the subject.

THE RELATION OF CHEMISTRY TO CONSTRUCTIVE SCIENCE.

The relation of chemistry to constructive science is not so generally well understood as it ought to be among inventors. It will be the purpose of this article to attempt an explanation, or rather to furnish some simple illustrations, which will render that relation more conspicuous to mechanics at large, than it seems to be at present.

In the first place it is to be premised that all useful mechanical work is directly performed by the motion of matter in masses. The knowledge of the laws which control these motions, or more philosophically speaking, the manner and order in which mass motion is increased or diminished, and manifests itself in work performed, constitutes the science of mechanics. Chemistry, on the other hand, comprises a knowledge of the laws by which the ultimate particles of matter—atoms, or molecules—move, and combine to form from the elements of compound substances, the substances themselves; and an investigation of the properties of both elementary and compound bodies, so far as these properties do not relate to the motions of bodies as masses.

Now, when it is remembered that molecular motion and mass motion are mutually convertible into each other, it must must be obvious that the boundary line between mechanical and chemical physics must be very dim and undefined, and we need not be surprised to find them, so to speak, overlapping. In fact, it is just about as difficult to say where one leaves off and the other begins as to draw a definite line between the animal and vegetable kingdoms.

As mechanical construction cannot be disconnected from a consideration of the nature of the materials employed, and as it is the chief province of chemistry to inquire into the nature of all the materials of the universe, it is obvious that a perfect mastery of constructive science involves a knowledge of the nature of materials and their chemical reactions when brought together. An extreme case might be supposed of a pump intended to raise dilute sulphuric acid, made of iron, zinc, or other metals upon which that substance acts with great violence. Or, as a further illustration, a dye vat, made of a metal which injures the color desired to be detained.

We could, however, readily give real illustrations culled from the large mass of correspondence which weekly passes through our hands, where want of sufficient chemical knowledge has led to grave error in invention, and subsequent loss in the attempt to put in practice what, so far as mechanical construction was concerned, were well conceived ideas.

These mistakes are more frequently committed in metallurgic inventions. For example, we not long since received a letter stating that the writer had invented an improved method of making steel, which would be an important thing when it made its advent; requesting us to give meanwhile information as to *what is the substance called carbon*. This is of course an extreme case, but attempts to improve processes for making iron and steel without a proper knowledge of the real nature of these metals are often made.

In metallurgy every furnace, squeezer, hammer, roller, or other implement employed, derives, or ought to derive, its form from the recognition of the chemical nature of the materials to be operated upon, as well as their mechanical properties. In the manufacture of textile fabrics and the construction of apparatus therefor, a knowledge of chemical principles is required, to ignore which is to surely work for failure instead of success.

The science of chemistry is so advanced that many processes, formerly accomplished mechanically, are now either in part or wholly performed by chemical action.

Thousands of wet gas meters were destroyed in this country a few years since by the use of crude glycerin as a substitute for water in them, through want of knowledge as to how that substance would act upon the drums, under the circumstances of the case. Now, glycerin being non-volatile, and remaining fluid at very low temperatures would seem to be the very thing needed for the purpose, and in a purer form it perhaps would be the thing needed, but owing to some cause which we have never seen explained, its use corroded the meters so badly that the result was as we have stated.

We will not carry these illustrations further. We have said enough to attract the attention of inventors to the importance of chemical knowledge to the mechanical constructor; a knowledge easily obtained, and so interesting in the peculiar character of its phenomena that its fascinations are second to no other department of natural science.

THE PRESENT RAPID IMMIGRATION.

The rate at which immigration to the United States is now progressing is quite unprecedented. On the Atlantic side Europe is pouring in vast numbers of people, of all ages, who, fleeing from the pressure of want, anticipate a life of comparative ease and plenty in the less crowded industries of the American Continent. On the Pacific slope, the Asiatic races are getting to form a large element of the population, and a useful element, too, if report speaks truly.

Many European journals are looking upon this movement with an ill-concealed anxiety, while some more boldly discuss the subject in all its relations. Some are asking the question what America is going to do with this large accession of labor, and augur great depression in current rates of wages in the United States, as its obvious result. Some English journals are endeavoring to turn the current of immigration from this country to Canada, a task, probably, as hopeless as could well be undertaken.

There is a peculiar attraction which our institutions possess for the oppressed laboring class in Europe, and it is a fact beyond dispute that the condition of such of this class as

manage to break away and get over here is greatly improved.

We are of those that think this influx of population will eventually be a benefit to this country, after the proper process of assimilation has been effected; and provided, always, a proper policy on the part of the general Government provides a home market for the increased production, consequent upon the increased number of producers. If, however, these people are to be converted, by a free-trade policy, into consumers of foreign goods, foreign governments may lay aside all fear. The stream of migration will be effectually retarded. Wages will be reduced to the European standard and the inducement which is now its chief stimulus will be, in a great measure, removed.

We do not share the fear entertained by some, that the mixed population we are acquiring will ultimately prove a disaster. That it may be, at a future time, the cause of dissentions and bickerings, perhaps of more serious troubles, is possible; but the forces are too nearly balanced to produce permanent disruption. There are few nationalities that retain their national peculiarities through more than one or two generations after their arrival in the United States; and the Germans, who, more than all others, do retain them, are a peaceable, order-loving people, governed by the dictates of reason rather than impulse. For the most part, they are educated, industrious, and thrifty citizens, and may well retain their harmless affection for the customs of the Father-Land. The Germans, also, bring with them great mechanical skill, which adds greatly to the resources of the country. Not a few of the most valuable inventions are made by Germans, and many kinds of industry draw largely upon this source for the skilled labor necessary to success.

Other elements of population, which are increasing by immigration, are well adapted to perform the ruder labor necessary to the construction of public works, and to supply the want of agricultural labor created by the recent war. If some of these are likely to prove hard to assimilate into an homogeneous whole, the result will be a quiet but sure extermination. They will share the fate of the native Indian, who, unwilling to accept civilization, has been gradually driven away by its advance.

The great rapidity with which immigrants are coming to this country is important in its bearings upon the great and ever-present labor question, and will render great caution necessary in the action of those who are endeavoring to advance wages and shorten hours of service.

SOMETHING ABOUT EYES.

The eyes have been called "the windows of the soul," an expression more poetical than scientific, unless we accept the belief that all living things, including corporations, have souls, which we are far from doing. We are even inclined to doubt that certain individuals of the *genus homo*—animals, supposed by many to have the exclusive monopoly of souls—really possess any, though they have sharp eyes to the "main chance." But whether a soul looks out of an eye or not, it is physiologically and scientifically an intensely interesting object. Dr. Dick has most justly remarked that "the eye is one of the nicest pieces of mechanism which the human understanding can contemplate."

The ball of the eye consists of three coats, the outer one of which is called the sclerotic coat. This coat is white and opaque, and constitutes what in ordinary parlance is called "the white" of the eye. In front this coat has a circular opening, very much like that in the case of an old-fashioned bull's-eye watch. In this coat is set the cornea, and is continuous with the sclerotic coat, being attached to it at the edge of the circular opening above described. The cornea is as transparent as any substance known to mankind. Inside the cornea is the choroid coat, which immediately surrounds the fluid called the vitreous humor, also a perfectly transparent substance. The choroid coat has a circular opening in front, to which is attached an annular curtain, which has the power of contraction or dilatation to adapt itself to varying intensities of light. This curtain is always colored, and it gives rise to the popular classification of eyes with reference to color, by which they are said to be black, blue, gray, etc. This curtain is opaque, and its contractile power depends upon a set of annular muscular fibers, arranged concentrically around a circular aperture in the middle of the curtain, which aperture is what is called the pupil of the eye. Another set of muscular fibers, arranged transversely to the circular set, pulling in all directions from the center of the pupil enables the latter to become larger when more light is needed for distinct vision. The cornea projects somewhat through the above described opening in the sclerotic coat, making the ball of the eye more convex at that point. Directly underneath it at this point, lies a fluid called the aqueous humor, which is so inclosed by the surrounding tissues that it forms a concavo-convex lens of the form called in optical works a *meniscus*. Directly behind this lens there is another body—the crystalline lens—which is also inclosed in the tissues so as to form a double convex lens, the front surface being less convex than the hindermost one. The mass of the eye ball is filled with the vitreous humor. The optic nerve penetrates the eye-ball on the back side below a point opposite the pupil, and passes obliquely upward, spreading out upon the posterior internal surface of the choroid coat, and forming what is called the retina. The office of the lenses above described is to concentrate the light in a proper manner upon the sensitive retina, from which the impression is transmitted to the brain by means of the optic nerve.

The eye is moved in all directions by means of beautiful muscles attached to the outside of the ball, one of which is an exact counter type of the mechanical element—the rope and pulley. This is the muscle which turns the eye obliquely toward the opposite shoulder, and is always used when we look at an object so placed. It passes through a loop at the top of the socket, and is then attached to the eye ball, when this muscle contracts, the eyeball is rolled inward and forward. This muscle has been considered as one of the most striking evidences of design in creation to be met with in the entire range of natural objects.

Volumes might be written upon the eye and the phenomena of vision, but what we have said will serve as a prelude to some curious facts in regard to eyes of inferior animals as well as those of the human race.

Dr. H. Power, in a recent lecture before the Royal Institution in London, asserted that very few animals are destitute of eyes. The *protozoa* and simplest animal forms seem to have no eyes, and such is the case with the polypi, which throw out arms to catch their food. Animals of the tape-worm class also have no eyes, probably because they live in darkness, and find a plentiful supply of food in the bodies of their patrons. The *radiata*, or star fishes, have only very doubtful organs of vision. Most of the *mollusca* including the oyster and the scallop, have very good organs of vision, and nearly all animals of a higher order than this class are furnished with eyes.

Some sea animals have eyes in their forehead; others have them in the brain. Some have plenty of eyes all along their sides or under their bellies, while others have them on the tips of their tails. The common snail has very good eyes on the tops of its horns, and the dragon-fly has more than 28,000 eyes.

Baer, an eminent German physician and oculist, says that blue eyes are capable of sustaining a much longer and more violent tension than black ones, and that the strength and duration of the sight depend upon the color of the eyes. We do not see any grounds for this statement, and therefore do not give it credence. The same author also remarks that black eyes are more subject to cataracts, which is perhaps the case, although we do not deem it as fully established. According to this writer, not one in twenty possessing black eyes are satisfied with their color. This may be true in Germany but we hardly think it correct for the United States. Our readers will remember that the "Merican frau," who was so extremely fascinating at "Hans Breitmann's Barty" had eyes of "himmel plue," which corroborates the statement of the learned Dr. Baer as to the German preference for eyes of that color.

Lavater esteemed blue eyes as a token of weakness and effeminacy of character, which, considered with reference to Buffon's assertion, that blue and orange-colored eyes are the most predominant, indicates that mankind at large are not to be credited with great strength of character. Buffon also asserts that many eyes supposed to be black are not really so, but if examined with a proper disposition of light will be found to be yellow, deep orange, or brown, which being opposed to the clear whiteness of the sclerotica appears so dark as to be mistaken for black. He further asserts that shades of yellow, orange, blue, and gray are to be found in the same eye; but that where blue is found it is invariably the predominant color. The blue tint is distributed over the iris in radial lines; while the orange is distributed about the pupil in flakes. The blue, however, so far overpowers the orange that such eyes appear entirely blue to ordinary observation. There are some eyes which are almost green, while the eyes of Albinos are either quite red or a bright orange color.

Lavater thought strength and manliness most frequently connected with brown eyes; but when the eyes incline to green, ardor, spirit, and courage were supposed to be indicated. It has been thought by many that dark-colored eyes belong to those most subject to melancholy and choler. Be this as it may, there can be little doubt, that as an index to character the eyes are the most significant feature in the human countenance; but as their expression is liable to rapid and great change as the emotions change, a cursory examination will often mislead.

NEW USES OF ANILINE.

Coal, a substance which we take up with tongs in order not to soil our fingers, is not only concentrated heat and light, but is the producer of the most beautiful coloring substances with which we are acquainted.

It has long been known that the aniline colors extracted from coal are used by the dyer, but it is much less generally known that they are applicable to many other purposes.

Since the year 1862 large quantities of aniline colors have been employed by paper manufacturers for the coloring of their paper pulp, or for the azuring of the surface of the paper after its final manufacture.

Aniline has here replaced ultramarine, metallic oxides, and dye woods. It is introduced in aqueous solution into the pulp or at the period of sizing.

The various kinds of shades for windows, lamps, etc., made to imitate fine porcelain, are colored by aniline. A design is printed on paper by means of an aniline lake, dissolved in a solution of a salt of aniline. This is then laid on damp albuminous paper. The color is taken up and fixed by the albumen, and the whole design is reproduced on the paper in a beautiful manner.

Wafers, sand for drying ink, etc., are colored by means of aniline.

Red and violet writing inks are prepared with salts of rosaniline.

Typographical inks are made by dissolving the colors in alcohol holding a resinous substance in solution, and which are precipitated by the addition of water. The precipitate, when dry, is pulverized and mixed with varnish and with ground barytes, or white zinc. Instead of barytes or zinc, starch colored by aniline may be rubbed into the varnish.

The same aniline colors are utilized for the coloring of hanging papers, aquarelles, photographs, etc. Photographs obtained by this process are very remarkable for their transparency and delicacy of tint.

Refuse of wool, in the shape of dust, colored by aniline, is employed to manufacture the "velvet-coated" papers.

Lakes on wood, with splendid metallic luster, are obtained by steeping the wood in hot concentrated solutions of aniline colors, drying rapidly in a current of heated air, and coating with a transparent varnish of copal dissolved in ether. The same operation applies to the coloring of straw hats, and to the production of artificial leaves.

Beads and false enamels are colored with aniline.

The colored globes used for public illuminations are also stained in the same way. For this purpose they are steeped in a solution of albumen, dried, and thrown into the aniline solution. By this simple process globes are obtained more splendid even than by the use of the solution of gold or Cassius purple.

Artificial stones, mother-of-pearl, and ivory are treated in an identical manner.

Soap, cold cream, pomatum, cosmetic powders, candles, and lucifer matches are colored by aniline.

The aniline blues and violets are at present of great benefit to the micrographer and anatomist for the dyeing of tissues which they color diversely according to the nature of their parts. For this purpose they have advantageously replaced carmine and ammonia, which often corroded and destroyed delicate membranes.

The red, blue, and violet with collodion form the best kind of liquid for the anatomical injection of capillaries and other minute vessels. After being thus injected they may be indefinitely preserved in glycerin.

Aniline colors derived from coal were discovered in 1856, a date which must ever be memorable in the annals of technology.

Accident to Professor Bunsen.

Professor Bunsen, of Heidelberg, recently met with a serious accident. He had received a large quantity of the metals of the platinum group, and was engaged in the preparation of pure rhodium. He had precipitated a large quantity of the finely-divided metal, and had placed it in a water bath to dry. Some one carelessly turned off the water from under the bath, so that when Bunsen went alone into his laboratory at midnight, he found that the heat of the vessel had risen to three hundred degrees Fahrenheit, instead of two hundred and twelve degrees, as it would have stood if water remained in the bath. He approached the vessel, put down his light, and put one finger in, to mark the condition of things. Suddenly there was a fearful explosion; both his eyes were severely burned; both his hands were torn into a mass of open wounds; but he had presence of mind not to drop the platinum capsule containing the rhodium, but put it back upon the furnace before he called for help.

The explosion and the call for assistance were fortunately heard by the servants, and he was immediately carried to his dwelling, which is in the same building with the laboratory. As soon as he had recovered from the unconsciousness following the accident, his first words were: "Let some one scrape up the rhodium from the floor, and save it."

It is known that some years ago Bunsen lost the use of one eye by a similar explosion; it was now feared that the remaining eye had been destroyed, but upon closer examination the physician expressed the hope that the injury was not incurable. Upon hearing this, this hero of science exclaimed: "Thank God! I can now ascertain what was the condition of the metal when it blew up."

But the injury to the noble man is very serious, and it will be a long time before he will be able to resume his scientific labors.

At the same time that the above information reaches us, comes also the sad intelligence of the death of the wife of Professor Kirchoff, the colleague of Professor Bunsen, and his associate in the great discoveries of the spectroscope. Men who enrich our knowledge as much as these two have done, are sure of the sympathy of the whole world when sorrow overtakes them.—*Post.*

Steam Road Roller.

A trial of the new steam road roller, purchased by the Central Park Commissioners to be used on the roads under their charge was made June 4th at the corner of 115th street, and 8th Avenue in this city.

The machine was made by Averill and Porter, Rochester, England, and we are informed, weighs about fifteen tons. It has four rollers, two front, and two back, so placed that the hinder ones cover the ground not rolled by the front ones.

Two of the rollers, perform the office of drivers; being turned by an endless chain and rag wheel; the others are made to turn like the forewheels of a waggon to guide the machine. The engine runs with a quick stroke and is speeded down so that great tractive power is obtained.

The ground on which the machine was exhibited, was of a very friable kind, being composed mostly of a coarse sand. We think its operation would have been still more satisfactory than it was, had the character of the ground been different. As it was, we believe all present were satisfied of the great efficiency of the machine, though we heard some improvements suggested. These were however made too hastily to be perhaps of much value.

We understand that this roller, has been used largely as a traction engine for moving heavy weights in the iron-works of London, and it seems admirably adapted to that purpose.

Snails as an Article of Food and Trade.

Land snails abound in Italy, Spain, France, and Belgium; they are also found in large quantities in Algeria, and most other points along the shores of the Mediterranean.

In Italy snails anciently were, and are still much used for the table. They are regularly sold in the markets of Switzerland, Spain, France, Belgium, and Algeria, and are exported alive, in barrels, to the French Antilles, and occasionally even to the United States, where they are relished only by the real "connoisseur."

In the vineyards of France, the peasants collect, feed, and fatten them, till winter, when the snails seal themselves up in their shells, where they remain torpid for several months. In this state they are purchased by the confectioners, who prepare them in the shell, with butter and herbs, and forward them to Paris. They are then ready for the table, after being heated in an oven for a few minutes.

In Belgium the snails are fed on lettuce, under inverted flower pots, for several months before being sent to market. Their price varies from fifty cents to one dollar a hundred.

In Transylvania, the large wood snail is a favorite dish. The animal is drawn out of the shell, well rubbed in a clean cloth, to take off the slime, cut small, mixed with savory stuffing, replaced in its shell, baked in the stove oven, and served up hot. In some parts of the country, instead of eggs and fowls, the peasants pay their tribute in snails and game. M. Page states one lady's ordinary winter supply as being upward of 5,000 snails.

We have occasionally seen imported snails served up in the shell, at restaurants in New York, and have watched foreign looking customers, who seemed to relish the meal. These snails are brought to this country by the steamers of the Havre line, during the winter months.—*Exchange.*

Editorial Summary.

THE Legislature of the State of New York, at its last session, authorized the construction of a railway station on the Fourth avenue, [illegible] Forty-[illegible] streets, and will occupy an area of about 800 feet in length by 800 feet in width, taking in for this purpose 150 feet on either side of the avenue. The Hudson River road is to be connected with the Harlem and New Haven track, and all the [illegible] St. [illegible] Park. The advantages, which [illegible] travelers and the [illegible]

CAST IRON STOVES.—At a recent meeting of the French Academy of Sciences a report was presented from the committee [illegible] off, while in use, a large quantity of carbonic acid; second, that the quantity of that gas given off from stoves of plate iron was often insignificantly small; third, that the car[illegible] recom[illegible] with fire brick and [illegible] so arranged as to leave space for [illegible] circulation of air [illegible] with a well drawing [illegible]

DIAMONDS were first discovered in Brazil in 17[illegible] by a Portuguese [illegible] Lobo, who was not even aware of the importance of his discovery until certain Dutch traders to whom he showed his pebbles [illegible] contracted with the Portuguese government for the [illegible] of all the raw diamonds they might find [illegible] The territory in which this [illegible] 44 [illegible] in length by 22 in breadth; it is called Terro de Fio, and is surrounded by steep mountains which long concealed [illegible] Since the mines have again become the property of the State of Brazil, the Dutch have not quite lost their monopoly; they being extremely skillful in the art of cutting diamonds and being possessed of all the requisite machinery for the purpose. The operation causes the stone to lose half its weight and is performed by means of wheels which make 2,000 revolutions per minute.

A CORRESPONDENT [illegible] "How to Make a Perpetual Motion" [illegible]

A CLOCK has been completed for the cathedral of Beauvais, France, which far surpasses all the existing specimens of the clockmaker's art. It contains no less than 90,000 wheels, and indicates, among many other things too numerous to recite, the days of the week, the month, the year, the signs of the zodiac, the equation of time, the course of the planets, the phases of the moon, the time at every capital in the world, the movable feasts for a hundred years, the saints' days, etc. Perhaps the most curious part of the mechanism is that which gives the additional day in leap year, and which consequently is called into action only once in four years. The clock is wound up every eight days. The main dial is twelve feet in diameter, and the total cost exceeds $50,000.

A BUSINESS way of doing things is to let people know what you have to sell, and there is no plan so efficient as a judicious system of advertising in journals of large circulation. As an evidence of the truth of our assertion and of the value of the SCIENTIFIC AMERICAN as an advertising medium, we make the following extract from a letter recently received from J. E. Mitchell, of Philadelphia: "I have derived more benefit from my advertisement in the SCIENTIFIC AMERICAN than from any other paper I ever advertised in, and have daily several applications for my pamphlet noticed under 'Business and Personal.' Please retain the cut as I wish to insert another advertisement."

THE eight-hour question was taken up at the cabinet meeting on May 25, and after an extended discussion it was decided that President Grant should issue a proclamation, or an Executive order, declaratory of the effect of the law upon wages, which is simply that the Act of Congress declares that eight hours' labor for the United States shall be a day's work, instead of ten, *without affecting the rate of wages.* The position taken by the President, stripped of all legal technicalities, is no doubt a correct interpretation of the true intent of the eight-hour law.

OUR esteemed exchange The *English Mechanic and Mirror of Science* must have either lost its spectacles or is laboring under the false impression that we have mislaid ours. In a review of a book recently published in London, entitled "The Modern Velocipede," it credits the the author with a passage on the "Mechanics of Walking," which originally appeared as a leading editorial in No. 13 current volume of the SCIENTIFIC AMERICAN. The paragraph is so unskillfully paraphrased as to make the intentional nature of the fraud only too apparent.

As a rule, food which is best enjoyed is best digested. Just so exercise which is most agreeable is usually the most beneficial. In selecting methods of exercise, every individual should be guided by his own individual tastes. It is better to change frequently from one exercise to another. It is well even to consult our whims and our varying moods. Above all things, we should strive to prevent our exercise from becoming a dry, hard, mechanical routine. The heart should go with the muscles.

AN IMMENSE GASOMETER.—The Manhattan Gas Company are building, at the foot of Eleventh street, in this city, a new gasometer of unusually large dimensions. The basin is 225 feet in diameter and 38 feet deep. The circular wall is 7 feet thick, arranged upon which are sixteen elegant guiding columns, each 73 feet high, of wrought iron, united at the top by ornamental girders. This will be one of the largest gasometers in the country.

ANCIENT medals of great historical value have recently been discovered in excavations made in the vicinity of Tarsus in Asia Minor. These medals were struck about A. D. 230, in honor of Alexander the Great, by order of the Emperor Alexander Severus, and contain portraits and symbolic heads of the conqueror of the ancient world. The Emperor Napoleon has paid $10,000 for four of these medals, and presented them to the imperial library of Paris.

TO CLEAR A ROOM OF MOSQUITOES.—A writer in a South Carolina paper says: "I have tried the following, and find it works like a charm. Take of gum camphor a piece about one third the size of an egg, and evaporate it by placing it in a tin vessel, and holding it over a lamp or candle, taking care that it does not ignite. The smoke will soon fill the room and expel the musquitoes."

THE question of the abolition of the Patent Laws was recently discussed in the British Parliament, and the London *Times* supports the measure. That journal has heretofore expressed its opinion very decidedly against the policy of granting patents for new inventions, but we do not remember that the *Times* has ever opposed the policy of conferring an exclusive copyright upon an author for producing a book.

ZINC may receive a fine black color on being submitted to the following process: Clean first the surface with sand and sulphuric acid, immerse for a very short time in a mixture of four parts of ammonia-sulphate of copper in forty parts of water, acidulated with one part of sulphuric acid, and, lastly wash and dry. When burnished, the black coating assumes a bronze color.

M. FREYCINET, who is preparing a work on the subject of interments in relation to public health, has calculated that the soil of the city of London contains nearly 500,000 tuns of human remains.

OF 18,496 prisoners in the penitentiaries of thirty States, in 1867, according to a report just issued, seventy-seven per cent, more than three quarters, had not learned a trade.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

[illegible] American [illegible] of the country. It is [illegible] secured by this community.

The gove[illegible] it is contempl[illegible] leone and half Napoleone [illegible] pieces, in United States currency $[illegible] and $1.93. The Austrian sovereign is worth $[illegible], and the Union crown $[illegible], so that the new coin will furnish an exact standard of exchange with France and Western Europe.

General Thorn, of the United States Engineers, has contracted with a [illegible] low tide. This will give a depth of twenty-eight or twenty-nine feet at average high tide.

A grand [illegible] at the point where the Portland, Saco and Ports[illegible] Rochester, and Portland and Kennebec roads [illegible] first road makes the extensive improvements now contemplated, and the second enters the city at the point proposed.

A [illegible] locomotive engineer named Young has been [illegible] States Court of Kansas for crushing his [illegible] cars, which made amputation necessary. The [illegible] against Platte county for $[illegible] unpaid railroad [illegible]

They have organized an Agricultural and Mechanical Institute in Kansas City. The general objects of the corporation, says the North Missouri *Courier*, are the encouragement and promotion of agriculture and the mechanic arts and the improvement of farm stock and domestic animals by means of annual or more frequent fairs.

The *North American* says that this country has 7,104 square miles to each mile of rail and 97,615 inhabitants. Mexico brings 1,033 [illegible] miles of area and 40,866 inhabitants to meet each of her 202 miles of road.

The movement at the port of Suez for 1868 is represented by the arrival of [illegible] of 394,[illegible] tons and carrying 22,347 passengers. The difference over 1867 is 63 craft, of 77,[illegible] tons, and with 7,086 passengers. These figures show the value of the Suez Ship Canal.

Bills have been presented in the Massachusetts House of Representatives to loan the credit of the State to the Massachusetts Central Railroad Company, to the amount of $3,000,000 and to the Boston, Hartford, and Erie Company to the amount of $[illegible],000,000.

The capital of the Paris, Lyons, and Mediterranean Railway Company now amounts to $[illegible]. It is expending $[illegible] of this on two lines in Africa—one from Algiers to Oran, the other from Philippeville to Constantine.

One steamer, the *Manhattan*, recently brought over to this country 1,[illegible] passengers. Among these were 500 English and Welsh mechanics. The Welsh were, however, chiefly miners, and they went immediately to [illegible]

An engineer resigned his position on a Western railroad in disgust, because, as he said, it consisted of nothing but the right of way and two [illegible]

The new wrought iron bridge on the Boston, Hartford and Erie Road, at Middletown, Conn., has been contracted for. It will be 1,200 feet span and will cost $[illegible]

[illegible] tons of steel rails, which the Erie Railroad Company have [illegible] one has been reported as broken.

The gas which leaks from London mains is said to be worth three-quarters of a million a year.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely [illegible] [illegible] advertisements at [illegible] a line, under the head [illegible]

☞ *All reference to back numbers should be by volume and page.*

[illegible] of the two metals [illegible] are inserted. [illegible] have heavy heads and they [illegible] of the balance.

R. R., of Pa.—We do not believe a positive rule can be given [illegible] of a steam valve unless the weight and speed of the [illegible]

E. B. J., of Chicago.—The evil effects caused by the [illegible] of oil and [illegible] get Appleton's Dictionary of Mechanics, and [illegible]

F. S., of Iowa.—We estimate the horse power of [illegible] to be 14. A twenty inch belt will not drive more than 60-horse [illegible] It is impossible to say from the data you give what is the reason for the slipping of your belt, but the presumption is that it is too small for the work.

J. W., of Mich.—You can prevent the [illegible] belt running on wood pulleys, to some extent by chalking the pulleys. If however, slipping occurs, the presumption is that the belt is too narrow to do the work demanded of it or it is running too lo[illegible]

M. S., of La.—You can undoubtedly raise water to the height of 54 feet by the centrifugal pump you describe, the amount of horse power required depends upon the amount to be raised and the condition of your pump.

W. W. S., of Ind.—There is little doubt that general protection from lightning can be afforded to a town by a proper number of well constructed lightning rods properly put up. We do not, however, think your scheme practicable.

L. Y., of N. Y.—The undulating motion of vessels at sea has often been employed as a motive power for pumps, etc. We have doubts however of its practicability as a means of propulsion for the vessel itself.

H. S., of Ohio.—The ordinary solder, two parts tin to one of lead will flow smoothly on tin when dipped, by previously putting sal ammoniac on the surface to be covered.

J. B., of Tenn.—A good cement for holding labels upon a metallic surface is a thickish varnish of gum shellac dissolved in alcohol.

W. F., of Mass.—Your proposition to make the exhaust steam, smoke, and ashes discharge into a receiver or tank placed in front of a locomotive is in our opinion impracticable.

A. C., of N. Y.—The sponge is generally recognized as belonging to the animal kingdom. You could have settled your bet by reference to Webster's dictionary.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

COTTON SEED PLANTER.—Nathan Breed, Jeffersonville, Ind.—This invention has for its object to furnish an improved cotton seed planter, which shall be simple in construction and effective in operation.

TUG BUCKLE.—D. S. Barker, Otterville, Mo.—This invention has for its object to furnish an improved tug buckle, strong, durable, simple in construction, reliable in use, and easily buckled and unbuckled, while at the same time holding the tug securely and receiving the draft strain squarely.

MEDICAL COMPOUND.—W. H. H. Peters, Tuskegee, Ala.—This invention provides an efficient remedy for treating rheumatism, neuralgia, gout, and diseases of nervous origin.

WELL PIPE DRIVER.—L. M. Rumsey and W. P. Smith, St. Louis, Mo.—This invention relates to important improvements in machines for driving [illegible] in the process of constructing "drive wells" for obtaining water and for other purposes of a similar nature.

BUCKET.—James H. Tomlinson, Chicago, Ill.—This invention relates to a new and useful improvement in buckets and pails, and all bailed vessels of a similar nature.

HOT BLAST OVEN.—Samuel Thomas and John Thomas, Hokendauqua, Pa.—This invention relates to a new and useful improvement in ovens or apparatus for heating air for smelting iron in blast furnaces.

APPARATUS FOR CUTTING GLASS.—Frank Bowly, of Winchester, Va., has recently taken out a patent for a convenient apparatus for cutting panes of glass to the exact size required, which is designed for glaziers' use, and for country stores where glass is retailed. It consists, in general terms, of a ruled board having a row of pins arranged along each lateral margin, any two of which are employed to hold a movable rest gage, against the edge of the latter one edge of the glass pane is placed, while the opposite end is trimmed or cut. The pins are separated by inch spaces, and a stationary rule of straight edge is used to guide the diamond. It is a simple and useful device.

ROTARY STEAM ENGINE.—Alfred Bailey, Oswego, N. Y.—This invention consists in the novel arrangement of steam and exhaust ports whereby the steam from the boiler is constantly entering the cylinder, and constantly exhausting therefrom. It also consists in the novel construction of the abutment slides, and in the mechanism provided for reversing the motion of the engine.

CORN PLANTER.—M. M. Sprinkle, Rochell, Va.—The object of this invention is to construct the seed-distributing device in such a manner that it shall operate more perfectly than heretofore.

SIFTER FOR FLOUR, ETC.—E. C. Hickman, Washington, D. C.—The object of this invention is to provide for public use a cheap and convenient device for sifting flour, etc.

REGULATING CLEVIS.—Elias Evans, Montgomery, Ala.—The object of this invention is to provide for public use a clevis of novel form and construction which can be easily adjusted so as to make the plow cut a furrow of any desired depth, and which will be light, strong, and durable.

STOVE.—Margaret Armstrong, West Alexander, Pa.—The object of this invention is to provide, in connection with a cooking stove of a certain pattern, an ornamental attachment adapted, when in position, to conceal the griddles and change the outward appearance of the stove, making it a handsome parlor stove.

BUCKLE.—Wm. Mac Lean and James H. Harris, Vermont, Ill.—This invention has for its object the connecting of buckles with straps without the use of stitching; and to this end, it consists in providing a buckle, with two loops at its rear end, one above another, the lower loop being for the retention of the fixed end of the strap, and the upper loop for the reception of the end after passing the tongue of the buckle through the strap.

BOILERS AND FURNACES.—I. C. Pennington, Paterson, N. J.—This invention has for its object to economize the use of fuel used in heating steam boilers, and reverberating and other furnaces, by using the heat escaping with the products of combustion for heating the air to support combustion before it is introduced into the fire box.

DRAWBRIDGE ALARM.—Thomas S. Hall, Stamford, Conn.—The object of this invention is to so construct and arrange the fastening device of a drawbridge, that the same when closed will interrupt the current through the wires of a battery, while, when open it will cause a connection between the same to be established, and a circuit produced. Thereby an automatic signal is produced for warning railroad trains approaching the bridge from either side when the bridge is open, while, when it is closed, the signal of danger will not be displayed.

SELF-ADJUSTING RAILROAD SWITCHES.—William L. Yantis, Brownsville, Mo.—This invention has for its object to improve the construction of switches or turnouts, so that they may be self-operating not requiring the service of a switchman, and at the same time may be safe and reliable, being always in proper position.

TOY.—Daniel Willis, Jersey City, N. J.—This invention [illegible] toy of that class in which figures of animals, such as horses [illegible] ranged in front of a toy cart or wagon, the object of the invention being to impart to such figures a motion similar to that of living animals, so that when the toy [illegible] in front with more [illegible] manner.

COMPOSITION FOR CLEANING GRANITE, FREESTONE, AND MARBLE.—H. L. [illegible] also to [illegible] the surfaces of granite, freestone, marble [illegible] kinds of stone employed in buildings, graveyards, monuments, and for other purposes, to free them from vegetable impurities, and to remove all blemishes.

ANTI-FRICTION METAL.—A. B. Cook, Manchester, Tenn.—This invention relates to a new metal to be used in journals, bearings, and boxes of all kinds, and has for its object to be less expensive and more effective than any other metal or metallic compound now in use.

FILE CUTTING MACHINE.—F. Schultz, Hoboken, N. J., and C. Renne, New York city.—This invention relates to a new machine for cutting files, which is of such simple construction and arrangement that it cannot readily get out of repair, and that it can be manufactured at a co[illegible] than that for which file-cutting machines can now be made.

CONNECTION FOR SWITCH ALARMS AND SIGNALS.—Thomas S. Hall, Stamford [illegible] new mechanism and ac[illegible] of the [illegible] of protecting the connecting [illegible]

[illegible] COAL.—David Morgan, Hammondsville, Ohio.—This invention relates to an improvement in separating sulphur from bituminous coal, and thereby rendering it more suitable for the purp[illegible] for which it is used.

DRILL.—L. M. Rumsey and W. P. Smith, St. Louis Mo.—This invention relates to a new and useful improvement in drills for penetrating earth or rock for obtaining water or for other purposes.

COMBINATION BRUSH.—Joseph Marshall, New York city.—This invention relates to a new and useful improvement in brushes for cleansing purposes, more especially designed for flesh brushes, but applicable to other uses, and consists in the combination of bristles or hair (or their equivalents) with sponge.

COTTON CULTIVATOR.—Samuel C. Barden, Connersville, Miss.—This invention relates to a new and improved machine for cultivating cotton, whereby much manual labor is saved, and it consists in a machine so constructed that it may be changed in its parts to adapt it for different purposes or for cultivating the cotton plant during the different stages of its growth.

STEP BALL FOR FIREARMS.—James Curtis, Chicago, Ill.—This invention relates to an improvement in musket balls, whereby they are made more effective in battle at close quarters than balls of ordinary construction.

PAPER POLISHER.—H. T. Cushman, North Bennington, Vt.—This invention is intended to remove a difficulty experienced by all who require to make erasures of letters, words, or marks made on paper with ink, in polishing or restoring the surface of the paper to permit re-writing thereon without blotting.

SOLDERING IRON HEATER.—Josiah Burgess, Zanesville, Ohio.—This invention consists in the combination with a naphtha burner of a furnace for heating soldering irons, so arranged as to control the heat generated to the best advantage for accomplishing the purpose.

REFLECTING ATTACHMENT FOR MIRRORS.—Charles I. Hartmann, London, England.—This invention relates to improvements in reflecting attachments for mirrors: and it consists in connecting the extension tubes employed for suspending a reflector for throwing the image of the back part of the head or other part of the person upon the mirror to the top of the said mirror by a universally jointed connection; also in connecting the reflector to the said tubes by a similarly jointed connection, whereby the said reflector may be readily adjusted to any required position, or be turned around to one side out of the way when not required for use.

MUSICAL INSTRUMENT.—Frederick Suter, Williamsburgh, N. Y.—This invention relates to a new musical apparatus, which is operated by means of keys on a fingerboard like the pianoforte. The invention consists in the employment of metallic disks, or plates, for the purpose of producing sounds in the requisite succession said disks or plates being secured to a suitable framework, so that they can be struck by hammers at the will of the operator.

MANUFACTURE OF SUGAR.—Louis J. F. Margueritte, Paris, France.—This invention relates to a new process for extracting sugar and increasing its produce in manufacture, refining, and forming it into loaves by means of alcohol. This process is based on the decomposition of the molasses by an energetic acid amidst the alcohol, to such a diluted degree that the sugar may be held in dissolution, but instead of obtaining the precipitation through the aceton (or pyro-acetic spirit), ether, etc., it is proposed to obtain it by more simple and direct crystallization.

HULLING MACHINE.—S. R. Hockman, Urbana, Ohio.—This invention relates to improvements in hulling machines, such as are used for hulling corn, barley, rice, and other grains, the object of which is to provide a more simple and economical machine than those now in use.

MACHINE FOR FORMING BITS FOR AXES.—Luke Chapman, Collinsville, Conn.—This invention relates to improvements in machines for shaping the steel bits for axes, and other similar tools, to facilitate fitting and welding them to the polls.

BEDSTEAD FASTENING.—Thomas O'Keefe, Appleton, Wis.—This invention consists of metal plates for screwing on to the face of the posts, or side rails, having two or more hooks projecting at right angles from the face at one edge, to be used in pairs, one on the post with the hooks facing upward, and the other on the side rail with the hook facing downward, and so arranged that the hooks of the plate on the rail will engage with and be supported by those on the post.

SPRING HINGE.—H. D. Middaugh, Mansfield, Pa.—This invention relates to improvements in spring hinges, designed to hold the d[illegible] in an open or closed position. It consists in the application to the back of the leaf to be screwed to the joint, of a coiled spring under suitable tension, which may be adjusted, the free end of the said spring being engaged with the edge of the other leaf of the hinge.

METHOD OF COVERING THREADS, FABRICS, ETC.—Carl Gunther, Berlin, Prussia.—The object of this invention is to provide means by which metallic foil can be secured to the fabrics or around threads and fibers, that it will not be removable by wear or water, and that its luster and brilliancy will not be destroyed. It has been a subject of considerable research to detect a means of gilding and silvering fabrics and threads, so that the metal applied would not wear off and destroy or injure the flexibility of the material. By this improved process the threads are left as flexible as they were before, and they can be folded at will, without breaking or injuring the metallic covering.

VELOCIPEDE.—Henry Thompson, Mobile, Ala.—This invention relates to improvements in velocipedes, designed to provide a simple and efficient arrangement for obtaining the motive power, by a rising and falling movement of the operator applied to an operating lever, similar to the motion of riding on horseback, and for imparting the same to the front wheel of a machine preferably having three or more w[illegible]

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FOR THE WEEK ENDING JUNE 1, 1869.

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Patent Solicitors, No. 37 Park Row, New York.

90,623.—STRAP FOR SAWS.—Emanuel Andrews, Williamsport, Pa. Antedated May 11, 1869.
90,624.—PAPER BAG MACHINE.—Charles F. Annan (assignor to B. S. Binney), Boston, Mass.
90,625.—BLIND FASTENER.—Franklin Babcock and Frederick Babcock, Middletown, Conn.
90,626.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Arthur Barbarin, New Orleans, La.
90,627.—STOP-MOTION FOR LOOMS.—A. A. Barker, Lewiston, Me.
90,628.—REVOLVING HARROW.—Caleb Bates, Kingston, Mass.
90,629.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.—Edwin E. Bean, Boston, Mass.
90,630.—HOT-AIR FURNACE.—P. D. Beckwith, Dowagiac, Mich.
90,631.—BUTTON FASTENING.—Jos. F. Blood, Providence, R. I.
90,632.—SAFETY ATTACHMENT FOR POCKETS.—Claudius V. Boughton, Titusville, Pa.
90,633.—FRUITING MACHINE.—Harvey Brisco and Job W. Blackham (assignors to themselves and James H. Prentice), Brooklyn, N. Y.
90,634.—GUN CAPPER.—Herbert Buffington, South Coventry, Conn.
90,635.—STEAM ENGINE SLIDE VALVE.—Wm. K. Cavett (assignor one-third to James L. Anderson), Allegheny City, Pa.
90,636.—BURGLAR ALARM.—H. D. Chance, Allentown, Pa.
90,637.—[illegible]—Isaac H. Clark (assignor [illegible]), Boston, Mass.
90,638.—SAW SET.—[illegible] Clendenen, Washington county, Ohio.
90,639.—HAND CULTIVATOR AND WEEDER.—Wm. G. Comstock, East Hartford, Conn.
90,640.—CORN PLANTER.—Abel Lee Crow, Pennville, Ind.
90,641.—TRACE BUCKLE.—E. A. Crownhart, Bridgeport, N. Y.
90,642.—FORGING HAMMER.—Samuel B. Dodge, Roslyn, assignor to himself and Daniel D. Winant, Brooklyn, N. Y.
90,643.—STEAM ENGINE CUT-OFF.—Samuel Dunbar, New York city.
90,644.—APPARATUS FOR GENERATING AND CARBURETING GAS.—Cleaveland F. Dunderdale, New York city.
90,645.—GRATE.—B. W. Dunklee, Boston, Mass.
90,646.—ELECTROGRAPHIC VOTE RECORDER.—Thos. A. Edison (assignor to himself and Dewitt C. Roberts), Boston, Mass.
90,647.—ATTACHING HANDS TO WATCHES.—Julius Eisen, Boston, Mass.
90,648.—BOOT-CRIMPING MACHINE.—Emmanuel Fach, Sandusky, Ohio.
90,649.—BEEHIVE.—I. B. Farquhar, Bloody Run, assignor to himself and J. W. Lingenfelter, Bedford, Pa.
90,650.—HAND-NAILER FOR LASTING BOOTS AND SHOES.—William H. Fischer (assignor to himself and G. H. Johnson), Boston, Mass.
90,651.—TOE-PIECE FOR LASTING MACHINE.—Wm. E. Fischer (assignor to American Lasting Machine Company), Boston, Mass.
90,652.—ROTARY HARROW.—Cyrus P. Fisher, Leesville, Ohio.
90,653.—GUANO ATTACHMENT FOR SEED DRILLS.—John F. Fisher, Greencastle, Pa., assignor to himself and Daniel Breed, Washington, D. C.
90,654.—BELL.—Wm. Fletcher, New York city.
90,655.—APPARATUS FOR ADJUSTING ECCENTRICS TO CONNECTING RODS.—George Fowler, Philmont, N. Y.
90,656.—VELOCIPEDE.—Wm. Frankel, Springfield, Ohio.
90,657.—AIR-SPRING FOR RAILROAD CARS.—Perry G. Gardiner, New York city.
90,658.—DEVICE FOR APPLYING GILDING PREPARATIONS TO OVAL FRAMES.—David Gardiner (assignor to Hall and Garrison), Philadelphia, Pa.
90,659.—VAPOR BURNER.—Thomas S. Gates and Alexander H. [illegible]
90,660.—COAL STOVE.—A. F. Graves and T. J. Clark, Red Wing, Minn.
90,661.—BOLT MACHINE.—James L. Hall, Abingdon, Mass.
90,662.—WATER METER.—T. C. Hargrave, Boston, Mass.
90,663.—ENVELOPE.—Bertrand Joseph Hoffacker, Melrose, N. Y.
90,664.—MACHINE FOR SCREWING AND SETTING [illegible].—Charles Holmes (assignor to Coester Gould, Jr.), Boston, Mass.
90,665.—CHURN.—Gaylord Jones (assignor to himself and James C. Stewart), [illegible], Mich.
90,666.—HARVESTER.—J. Byron Jones, Rockford, Ill.
90,667.—METALLIC ROOFING.—John W. Kingman, North Bridgewater, Mass.
90,668.—BEAD-SETTER FOR GLAZIERS' USE.—Moses Kleeman, Columbus, Ohio.
90,669.—APPLIANCE TO HAMES AND MEANS OF HITCHING HORSES TO VEHICLES.—John L. Kreider, Chestnut Level, Pa.
90,670.—[illegible] APPARATUS.—Samuel Lancaster (assignor to himself and [illegible]), St. Louis, Mo.
90,671.—BRICK TOWER.—Jacob E. Lutz, East Conestoga township, Pa.
90,672.—CIDER PRESS.—Jacob Maechoffer, Boonville, Mo.
90,673.—HOOP SKIRT.—Joseph Mayer, Brooklyn, N. Y., assignor to himself and Julius Waterman, New York city.
90,674.—CHURN.—Walter S. McManus and Robert S. Merryman, Brunswick, Me.
90,675.—COMPOSITION FOR THE PRODUCTION OF WAX FLOWERS, FRUIT, ETC.—Emily W. Meyers, Lincoln, Ill.
90,676.—COFFEEPOT, BOILER, DIGESTER, OVEN, AND LAMP.—James Montgomery, New York city.
90,677.—REDUCING SULPHUR ORE.—Charles W. Moore, San Francisco, Cal.
90,678.—GAS AND WATER METER.—George Rodney Moore, Philadelphia, Pa.
90,679.—BARREL STAVE.—Charles Morrison, Hartford, Conn.
90,680.—WAGON SEAT.—John H. Nale (assignor to himself and John G. [illegible]), [illegible]
90,681.—MACHINE FOR MAKING BUTTON MOLDS.—John S. Palmer, Providence, R. I.
90,682.—COMBINATION LOCK.—Oliver E. Pillard (assignor to Frederick H. North), New Britain, Conn.
90,683.—PERMUTATION LOCK.—Oliver E. Pillard (assignor to Frederick H. North), New Britain, Conn.
90,684.—CHIMNEY COWL.—Jos. F. Pond, Cleveland, Ohio.
90,685.—NUT LOCK.—William P. Porter, Pittsburgh, Pa., assignor to "Pittsburgh Forge and Iron Company."
90,686.—SPRING BIT.—Lewis Preston, Elizabeth Port, N. J.
90,687.—VELOCIPEDE.—Henry Rathmann and George H. Johnson, Buffalo, N. Y.
90,688.—DRY EARTH WATER CLOSET.—H. O. Reed and Joseph W. Fowle, Boston, Mass.
90,689.—SPOKE LATHE.—Isaac S. Roland, Reading, Pa.
90,690.—MANUFACTURE OF BUNGS.—Benjamin D. Sanders, Wellsburg, West Va.
90,691.—COMBINED HOE AND RAKE.—F. Le Roy Sexour, Eaton, Ohio.
90,692.—ALARM LOCK.—Nicholas Seubert, Syracuse, N. Y.
90,693.—RIVETING MACHINE.—Thomas Shaw, Philadelphia, Pa., assignor to himself and Philip S. Justice.
90,694.—WASH BOILER.—Joel Shedd, Waltham, Mass.
90,695.—PAPER AND PRINT ROLLER.—H. Julius Smith, Boston, Mass., assignor to himself and Richard Smith.
90,696.—STEAM ENGINE GOVERNOR.—Wm. Smith, Philadelphia, Pa.
90,697.—MOWING MACHINE.—Alvin Soule, Yarmouth, Me.
90,698.—CORN PLANTER AND FERTILIZER.—M. M. Sprinkle (assignor to himself and Robert C. Garnett), Rocheville, Va.
90,699.—LOCKING BURR.—J. J. Steward, Big Prairie, Ohio.
90,700.—AUTOMATON HOOP.—Luke W. Taylor, Weathersfield, Vt. Antedated May 28, 1869.
90,701.—SPRING ROCKING CHAIR.—Daniel E. Teal, Norwich, N. Y. Antedated May 19, 1869.
90,702.—LITHOGRAPHIC INKING ROLLER.—S. D. Tucker, New York city.
90,703.—HEDGE PLANTER.—J. J. Tucker, Eugene, Ill.
90,704.—COMBINED PUNCH AND SCREW DRIVER.—S. D. Tuttle, Eaton, Ohio.
90,705.—DENTAL MOUTH METER.—C. Von Bonhorst, Lancaster, Ohio. Antedated May 15, 1869.
90,706.—DENTAL ARTICULATING CUP.—C. Von Bonhorst, Lancaster, Ohio. Antedated May 12, 1869.
90,707.—COFFEEPOT.—A. B. Walters, Philadelphia, Pa.
90,708.—RAILWAY GATE.—D. J. Waltz, H. A. Solliday, and Wm. Hanesher, Doylestown, Ohio.
90,709.—DEODORIZING WATER CLOSETS.—G. E. Waring, Jr., Newport, R. I., assignor to the Earth-closet Co., Hartford, Conn.
90,710.—FERRULE FOR SHOE STRINGS.—G. H. White, Huntington, N. Y. Antedated May 26, 1869.
90,711.—MACHINE FOR MANUFACTURING WEBBING FOR LADIES' FANS.—J. W. White, Weymouth, Mass.
90,712.—STOVE SHELF.—D. D. Whitney, Leominster, Mass.
90,713.—HARROW.—J. P. Wilo, Nashville, Mich.
90,714.—CARRIAGE WHEEL.—Elbridge G. Woodside, San Francisco, Cal.
90,715.—MEDICAL COMPOUND.—Henry Adolph, Clinton, Kansas.
90,716.—BEER COOLER.—John Agate, Pittsford, N. Y.
90,717.—WATER METER.—R. N. Allen, Pittsford, Vt.
90,718.—PUMPING LEVER.—J. S. Appel, Kulpsville, Pa.
90,719.—COOKING STOVE.—Margaret Armstrong, West Alexander, Pa.
90,720.—STEAM HEATER.—A. C. Bacon, Bergen, N. J.
90,721.—ROTARY STEAM ENGINE.—Alfred Bailey, Oswego, N. Y.
90,722.—COTTON-SEED PLANTER.—Nathan Bread, Jeffersonville, Ind.
90,723.—VELOCIPEDE.—G. C. Buell, New Haven, Conn.
90,724.—PORTABLE SOLDERING FURNACE.—Josiah Burgess, Zanesville, Ohio.
90,725.—TUG BUCKLE.—D. S. Butler, Otterville, Mo.
90,726.—MACHINE FOR FORMING BITS FOR AXES.—Luke Chapman, Collinsville, Conn.
90,727.—MODE OF PREVENTING CANALS, ETC., FROM BEING CLOSED BY ICE.—R. A. Chesebrough, New York city.
90,728.—STEAM-ENGINE LUBRICATOR.—Isaac Church, Jr., Norwalk, Conn.
90,729.—ANTI-FRICTION METAL.—A. B. Cook (assignor to W. S. Huggins), Manchester, Tenn.
90,730.—CAR COUPLING.—J. W. Currier, Springfield, Mass.
90,731.—DEVICE FOR HOLDING INTERFERING BANDS IN PLACE.—J. W. Currier, Springfield, Mass.
90,732.—PROJECTILE.—Jas. Curtis, Chicago, Ill.
90,733.—COMPOSITION PAPER POLISHER.—H. T. Cushman, North Bennington, Vt.
90,734.—COTTON CULTIVATOR.—Samuel C. Davison, Summerville, Miss.
90,735.—BEEHIVE.—Millington Easley, Rush, Ill.
90,736.—CLEVIS.—Elias Evans, Montgomery, Ala.
90,737.—MEAT CHOPPER.—C. H. Finson (assignor to himself and Joseph Semple), Bangor, Me.
90,738.—BOAT-DETACHING APPARATUS.—Jas. Foster, Jr., (assignor to himself and Noah Hand), Camden, N. J.
90,739.—MACHINE FOR FORMING SHIRT BOSOMS FROM PAPER AND CLOTH COMBINED.—R. P. Furlong, Portland, Me.
90,740.—MODE OF COATING THREADS WITH METALS.—Carl Günther, Berlin, Prussia, assignor to Frederick Vollman, Hoboken, N.J.
90,741.—FIRE-ARM.—J. W. Goodale, Amherst, Mass.
90,742.—ATTACHING PICKS TO THEIR HANDLES.—R. C. Grover and C. W. Randall, Newton, Mass.
90,743.—CONNECTION FOR DRAW-BRIDGE SIGNALS.—Thos. S. Hall, Stamford, assignor to Hall's Electric Railway Switch and Drawbridge Signal Co., New Haven, Conn.
90,744.—SWITCH-ALARM CONNECTION.—Thos. S. Hall, Stamford, assignor to Hall's Electric Railway Switch and Drawbridge Signal Co., New Haven, Conn.
90,745.—RAILWAY CHAIR.—C. A. Harris, Owego, N. Y.
90,746.—LOOKINGGLASS ATTACHMENT.—C. J. Hartmann, London, England.
90,747.—PLOW.—C. Hartzell, St. Joseph, Mo.
90,748.—FAN.—T. W. Hawkins, New Haven, Conn.
90,749.—AIR GUN AND PISTOL.—E. H. Hawley, Kalamazoo, Mich.
90,750.—FLOUR SIFTER.—E. C. Hickman, Washington, D. C.
90,751.—PORTABLE FENCE.—C. R. Hight, Geneva, Ill.
90,752.—HULLING MACHINE.—S. R. Hockman, Urbana, Ohio.
90,753.—BOOT AND SHOE-TOP.—John Honecker, Columbus, Ohio.
90,754.—COMPOUND FOR CLEANING STONE, ETC.—M. L. Ivers, Oneco, and O. L. Cooley, Plainfield, Conn.
90,755.—AUGER BIT.—W. A. Ives, New Haven, Conn.
90,756.—COOKING STOVE.—W. J. Keep, Troy, N. Y.
90,757.—SHAFT COUPLING.—A. J. Langworthy, Milwaukee, Wis.
90,758.—CHURN.—Servetus Leach, Wilbraham, Mass.
90,759.—AUGER BIT.—H. C. Lewis, Essex, Conn.
90,760.—HORTICULTURAL BUILDING.—Francis Ludlow, Lake View, Ill.
90,761.—[illegible] TIE.—Edward Thomas Mainwaring, Tipton, England.
90,762.—EXTRACTING, REFINING, AND CRYSTALLIZING SUGAR.—[illegible], Paris, France.
90,763.—BATH BRUSH.—Joseph Marshall, New York city.
90,764.—REVOLVING CLOTHES DRYER.—John McCaskey, Jr., Orrville, Ohio.
90,765.—DENTAL PLATE.—J. A. McClelland, Louisville, Ky.
90,766.—MACHINE FOR TREATING COLLODION AND ITS COMPOUNDS.—J. A. McClelland, Louisville, Ky.
90,767.—BRIDGE.—John A. McKay, Auburn, Ind.
90,768.—ADJUSTABLE CLAMP.—C. S. Mecker (assignor to himself and T. B. Carpenter), New Haven, Conn.
90,769.—SPRING HINGE.—H. B. Middaugh, Mansfield, Pa.
90,770.—ROLLER GRAIN DRILL.—Oliver P. Mosnany, Dowagiac, Mich.
90,771.—BAKE OVEN.—Daniel Moore, Davenport, Iowa.
90,772.—MACHINE FOR DESULPHURIZING BITUMINOUS COAL.—David Morgan, Hammondsville, Ohio.
90,773.—FENCE POST.—E. G. Nichols, Beaufort, S. C.
90,774.—VELOCIPEDE.—Alfred Nielsen, Williamsburg, N. Y.
90,775.—TIRE-HEATING OVEN.—C. G. Nye, Onondaga, N. Y.
90,776.—BEDSTEAD FASTENING.—Thomas O'Keefe, Appleton, Wis.
90,777.—ELECTRO-MAGNETIC AMALGAMATOR FOR GOLD AND SILVER.—A. B. Paul, San Francisco, Cal.
90,778.—STEAM GENERATOR FURNACE.—I. C. Pennington, Paterson, N. J.
90,779.—MEDICAL COMPOUND.—W. H. H. Peters, Tuskegee, Ala.
90,780.—BEDSTEAD FASTENING.—C. D. Purdy, La Porte, Ind.
90,781.—BEARING FOR SPINDLES AND SHAFTS.—S. W. Putnam, Jr., Fitchburg, Mass.
90,782.—VELOCIPEDE.—G. P. Reed, Boston, Mass.
90,783.—AUXILIARY JAW FOR PLANER CHUCK.—C. H. Riggs, Windsor Locks, Conn.
90,784.—SAW FILE.—Wm. Roberts, Blue Hill, Me.
90,785.—STOVEPIPE SHELF.—Obed Ruggles, Franklin, Mass.
90,786.—PIPE DRIVER.—L. M. Rumsey and W. P. Smith, St. Louis, Mo.
90,787.—DRILL FOR ROCK AND EARTH WITH ATTACHED TUBE.—L. M. Rumsey and W. P. Smith, St. Louis, Mo.
90,788.—MACHINE FOR CUTTING FILES.—F. Schultz, Hoboken, N. J., and C. Reese, New York city.
90,789.—MACHINE FOR WIRING BLIND SLATS.—J. M. Seymour and Daniel Whitlock, Newark, N. J.
90,790.—TEA AND COFFEEPOT.—Samuel Simpson (assignor to Simpson, Hall, Miller & Co.), Wallingford, Conn.
90,791.—SAW GUIDE AND JOINTER.—G. A. Smith, Blecker, N. Y.
90,792.—BREECH-LOADING FIRE-ARM.—W. S. Smoot, Washington, D. C., assignor to Thos. Poultney, Baltimore, Md.
90,793.—MUSICAL INSTRUMENT.—Frederick Suter, Williamsburgh, N. Y.
90,794.—STEAM-GENERATOR SAFETY VALVE.—Henry Taylor and J. M. Coale, Baltimore, Md.
90,795.—RAILWAY CAR TRUCK.—H. Thielsen, Burlington, Iowa.
90,796.—HOT-BLAST OVEN FOR IRON FURNACES.—S. Thomas and J. Thomas, Hokendauqua, Pa.
90,797.—VELOCIPEDE.—Henry Thompson, Mobile, Ala.
90,798.—BUCKET.—J. H. Tomlinson, Chicago, Ill.
90,799.—STEAM PLOW.—S. B. Wilkins, Milton, Pa.
90,800.—VISE.—J. B. Willett, West Meriden, Conn.
90,801.—TOY.—Daniel Willis, Jersey City, N. J.
90,802.—IMPRESSION DENTAL CUP.—C. L. Wuestenberg, Pittsburgh, Pa.
90,803.—SELF-ADJUSTING SWITCH FOR STREET CARS.—W. L. Yantis, Brownsville, Mo.
90,804.—TRUNK LOCK.—Hermann Ahrend, Brooklyn, N. Y.
90,805.—LOCK FOR PIANOS, ETC.—Hermann Ahrend, Brooklyn, N. Y.
90,806.—AUTOMATIC FIRE ALARM APPARATUS.—Alex. Allen, Rochester, N. Y.
90,807.—GRAIN BINDER.—J. F. Appleby (assignor to himself and Wm. Thompson), Mazo Manie, Wis.
90,808.—HINGING TEA-KETTLE COVERS.—E. S. Atwood (assignor to "Pratt & Wentworth"), Boston Highlands, Mass.
90,809.—BURGLAR ALARM.—Henry Bergstein, San Francisco, Cal.
90,810.—HOISTING APPARATUS.—Eugene H. Bernier, Paris, France.
90,811.—BELL.—A. G. Bevin, East Hampton, Conn.
90,812.—HALTER HITCH.—A. T. Boon and Lucien Mills, Galesburg, Ill.
90,813.—COMPOSITION FOR DRESSING HARNESS AND OTHER ARTICLES MADE OF LEATHER.—M. T. Boyd, Buffalo, N. Y.
90,814.—GUN CARRIAGE.—L. W. Broadwell, New Orleans, La.
90,815.—PYROMETER.—Edward Brown, Philadelphia, Pa.
90,816.—COMB.—Haydn Brown and S. N. Noyes (assignors to S. C. Noyes & Co.), West Newbury, Mass.
90,817.—WASHING MACHINE.—Frank Bucklew, San Rafael, Cal.
90,818.—HAY RAKER AND LOADER.—H. P. Burdick, Buffalo, N. Y.
90,819.—CONSTRUCTION OF RETORTS FOR THE MANUFACTURE OF COAL GAS.—W. J. Cochran, Baltimore, Md.
90,820.—SPRING BED BOTTOM.—J. L. Cooper and E. A. Monroe, Elmira, N. Y.
90,821.—AUTOMATIC RAILWAY GATE.—R. P. Crane, Beloit, Wis., and Ellery B. Crane, Worcester, Mass.
90,822.—STONE-DRESSING MACHINE.—J. T. Cree, Worcester, Mass.
90,823.—[illegible] APPARATUS.—Lewis Cutting, San Francisco, Cal.
90,824.—PREPARATION OF MINERAL CARBON FOR USE IN THE ARTS.—John Dickenson, Bay Ridge, N. Y.
90,825.—COMPOSITION FOR PAVING, ROOFING, AND FOR OTHER PURPOSES.—[illegible], Washington, D.C.
90,826.—TURBINE WATER WHEEL.—Robert Dunbar, Buffalo, N. Y.
90,827.—TREATMENT OF GRAIN MASHES, WORTS, AND BEER, AFTER FERMENTATION.—Nathan Eisendrath, Chicago, Ill.
90,828.—BOOT CRIMPING MACHINE.—J. A. Eldridge, Milford, Mass.
90,829.—WAGON BRAKE.—W. R. English and Stephen Rogers, English Center, Pa.
90,830.—COMBINED VAPOR BURNER AND LAMP-POST.—B. D. Evans, Columbus, Ohio.
90,831.—GANG PLOW.—C. A. Fargo, Soquel, Cal., assignor to himself and Barber Darling.
90,832.—CASTANET.—G. F. Fessenden, Arlington, Mass.
90,833.—LIFE BOAT.—C. D. Flynt, Philadelphia, Pa.
90,834.—APPARATUS FOR FELLING TREES.—M. R. Fory, New York city.
90,835.—TEA AND COFFEEPOT.—T. F. Frank, Buffalo, N. Y.
90,836.—GREEN CORN FORK.—W. L. Gilroy, Philadelphia, Pa.
90,837.—VELOCIPEDE.—Joseph Guild, Buffalo, N. Y.
90,838.—LOOM PICKER SHOE.—E. J. Hall, Cambridge, Mass., assignor to [illegible] and Edwin A. Hall.
90,839.—FARM GATE.—T. F. Hall, Circleville, Ohio.
90,840.—SPRING BED BOTTOM.—William Haworth, Canton, Ohio.
90,841.—ELECTRIC CLOCK.—M. Hipp, Neufchatel, Switzerland.
90,842.—PORTABLE SCAFFOLD.—A. E. Herrington and J. D. Richards, Schoolcraft, Mich.
90,843.—CIDER MILL AND PRESS.—Francis Hovey and G. F. Hovey, New York city.
90,844.—GRAIN SEPARATOR.—Andrew Hunter, San Francisco, Cal.
90,845.—ADJUSTABLE WINDOW SCREEN.—D. N. Hurlbut, Chicago, Ill.
90,846.—GAS-HEATING AND COOKING APPARATUS.—F. A. Jacquet, Paris, France.
90,847.—GRAIN DRYER.—G. H. Johnson and George Milsom, Buffalo, N. Y.
90,848.—APPARATUS FOR MAKING EXTRACTS FROM TAN BARK.—T. W. Johnson, New York city, assignor to himself and H. C. Johnson, Jr. Antedated May 22, 1869.
90,849.—BUCKLE.—W. V. Kay, Chicago, Ill., assignor to S. S. Sargeant, Newark, N. J.
90,850.—COOKING STOVE.—W. J. Keep, Troy, N. Y.
90,851.—RAILWAY STOCK CAR.—J. S. Kendall, Northfield, Minn., assignor to himself, Ralph Emerson, and W. A. Talcott, Rockford, Ill.
90,852.—COAL STOVE.—Nathaniel Keyser, Newton, Iowa.
90,853.—LOW-WATER INDICATOR FOR BOILERS.—Hiram Kimball, Rockford, Ill.
90,854.—MODE OF TREATING WOOD TO RESEMBLE CARVED WORK.—Wm. Copp and Wm. Wrampelmeier, Louisville, Ky.
90,855.—TOOTHPICK.—Alphonse Krieck (assignor to himself, Thomas Richardson, and John Smith), Philadelphia, Pa.
90,856.—RAILWAY STOCK CAR.—Hugh Lee, Beloit, Wis.
90,857.—BRIDLE BIT.—Josiah Letchworth, Buffalo, N. Y.
90,858.—PRINTING PRESS.—J. C. Macdonald, Waddon, and Joseph Calverley, Albany Road, Camberwell, England. Patented in England December 5, 1868.
90,859.—BUCKLE.—Wm. Maclean and J. H. Harris, of Vermont, Ill.
90,860.—BASE-BURNING STOVE.—H. C. March, Limerick Station, Pa.
90,861.—WAGON SPRING.—E. P. McCarthy, San Francisco, Cal., assigned to himself and John Grant.
90,862.—ATTACHING COLLARS FOR STOVEPIPES.—F. H. Merrill, Cape Elizabeth, Me.
90,863.—LAMP BURNER.—E. S. Merrill and Wm. Carleton, Boston, Mass.
90,864.—DOOR LOCK.—J. F. Milligan, St. Louis, Mo.
90,865.—DEVICE FOR HOLDING HORSES ATTACHED TO CARRIAGES.—Augustus Moore and John Aplyard, Mission of San José, Cal.

90,866.—Thill Coupling.—D. W. Onderdonk (assignor to himself, P. A. Castle, and A. S. Ondrrdonk), Attica, N. Y.
90,867.—Nut Lock.—George Palmer, Littlestown Pa.
90,868.—Bomb Lance.—Ebenezer Pierce, Hallowell, Me.
90,869.—Velocipede.—J. F. Piper, Boston, Mass.
90,870.—Book Holder.—W. S. Poulson, Cadiz, Ohio.
90,871.—Priming Metallic Cartridges.—T. J. Power, New York city, assignor to J. P. Fitch and J. R. Van Vechten.
90,872.—Machine for Making Tin-Lined Lead Pipe.—John Robertson, Brooklyn, N. Y.
90,873.—Beehive.—J. M. Reinelt, Centralia, Ill.
90,874.—Safety Valve.—Thomas Rowe, New York city.
90,875.—Smut Machine.—M. R. Rabie, Nineveh, Ind.
90,876.—Belt Coupling.—Theodore Rudiger, Oberle's Corners, Mich.
90,877.—Apparatus for Clipping the Hair from Horses, etc.—Salom H. Salom, London, and Thomas Field, Westminster, Great Britain; said Thos. Field assigns his right to said Salom.
90,878.—Buckle.—A. V. Sargeant, Syracuse, N. Y.
90,879.—Dental Plugging Instrument.—John N. Scranton, Bennington, Vt., and H. H. Parsons, Hoosick Falls, N. Y.
90,880.—Hinge.—A. P. Seymour, Jr., Hecla Works, N. Y.
90,881.—Clothes Pin.—L. T. Simon, New York city.
90,882.—Churn.—Jas. Simpson, Libertyville, Ill.
90,883.—Umbrella Runner.—Orren M. Smith, Philadelphia, Pa.
90,884.—Steam-Engine Piston.—Wm. G. Snook (assignor to himself, A. B. Gorton, and O. C. Patchell), Corning, N. Y.
90,885.—Base Burning Stove.—G. S. Stanard, Buffalo, N.Y.
90,886.—Still for Alcohol.—Ernst Gottlieb Starck, Chicago, Ill.
90,887.—Steam Balanced Slide Valve.—John D. Stewart, La Porte, Ind.
90,888.—Loom.—Albert Stockwell, Providence, R. I.
90,889.—Cooking Stove.—G. W. Swett, Troy, N. Y.
90,890.—Attachment for Wagon Pole.—Wm. Trump, Louisville, Ohio.
90,891.—Coating Articles of Iron Ware.—Hiram Tucker, Newton, Mass.
90,892.—Surfacing Articles of Cast Metal.—Hiram Tucker, Newton, Mass.
90,893.—Electro-Gilding Iron.—Hiram Tucker, Newton, Mass.
90,894.—Electro-Plating and Gilding Cast Iron.—Hiram Tucker, Newton, Mass.
90,895.—Plow.—W. H. Tyler, Conneautville, Pa.
90,896.—Snap Hook.—Fred. Valentine (assignor to "Pratt & Letchworth"), Buffalo, N. Y.
90,897.—Nut Bar.—Samuel Vanstone (assignor to himself and J. W. Heard), Providence, R. I.
90,898.—Machine for Making Paper.—C. B. Van Valkenburgh, Vaalie, N. Y.
90,899.—Locomotive Spark and Smoke Conductor.—John Viall, Somerville, Mass.
90,900.—Wooden Shoe.—W. A. Webster, Westford, Mass.
90,901.—Whiffletree.—Norman Westcott, Morrisville, N.Y.
90,902.—Shoe Nail.—H. F. Whidden, South Abington, Mass.
90,903.—Machine for Making Brushes.—A. M. White, Thompsonville, assignor to American Brush Company, New Haven, Conn.
90,904.—Thrashing Machine.—A. S. Whittemore, Willimantic, Conn.
90,905.—Cultivator.—L. H. Wilkinson, Michigan City, Ind.
90,906.—Rod for the Construction of Bird Cages.—J. H. Williams, New York city.
90,907.—Planing Machine.—Seth Wilmarth, Malden, Mass.
90,908.—Corn Marker.—S. J. Woland, Lincoln, Ill.
90,909.—Harvester.—G. W. N. Yost, Corry, Pa.
90,910.—Fireplace Stove.—David Stuart and Lewis Bridge, Philadelphia, Pa.

REISSUES.

87,925.—Cooking Stove.—Dated March 16, 1869; reissue 3,468.—Jas. Greer and G. J. King, Dayton, Ohio.
69,238.—Preserving Dead Bodies.—Dated Sept. 24, 1867; reissue 3,469.—J. D. Nietsche, Somerset, Ohio.
71,431.—Head-Light for Locomotives.—Dated Nov. 26, 1867; reissue 3,470.—A. C. Vaughan, Philadelphia, Pa.
56,887.—Flour Bolt.—Dated Aug. 7, 1866; reissue 3,472.—J. C. Blythe, Mark Johnson, J. S. Nobles, and Chas. W. G. Nobles, Perry, N. Y., assignees of J. C. Blythe.
57,467.—Railroad Rail.—Dated August 28, 1866; reissue 3,473.—J. L. Booth, Rochester, N.Y.
29,374.—Machine for Thrashing and Cleaning Grain.—Dated July 31, 1860; reissue 3,474.—Cornelius Aultman, Mansfield, Ohio, assignee by mesne assignments, of Ira Hart.
18,205.—Machine for Making Tapered Wire Blanks.—Dated Sept. 15, 1857; reissue 3,475.—Division A.—C. Jillson, Worcester, Mass.
18,205.—Method of Forming Conical Points on Wires, Rods, etc.—Dated Sept. 15, 1857; reissue 3,476.—Division B.—C. Jillson, Worcester, Mass.
14,254.—Cultivator Tooth.—Dated Feb. 12, 1856; reissue 3,477.—C. H. Sayre, for himself and the Remington Agricultural Works, Ilion, N. Y., assignees, by mesne assignments, of C. H. Sayre and Geo. Kilburn.
33,499.—Harvester.—Dated Oct. 15, 1861; reissue 1,701, dated June 14, 1864; reissue 3,478.—J. F. Seiberling, Akron, Ohio.
12,077.—Process of Treating the Mother-Water of Salines to Obtain Useful Products.—Dated Dec. 12, 1854; extended seven years; reissue 3,479.—Division A.—Amalie Sileren, Natrona, Pa., assignee, by mesne assignments, of Edward Sileren, deceased.
12,077.—Apparatus for Obtaining Bromine and other Products from the Mother Water of Salines.—Dated Dec. 12, 1854; extended seven years; reissue 3,480.—Division B.—Amalie Sileren, Natrona, Pa., assignee, by mesne assignments, of Edward Sileren, deceased.
24,588.—Hay Spreader.—Dated June 28, 1859; reissue 3,481.—J. C. Stoddard, Worcester, Mass.
79,024.—Fabric for Covering Horse Collars.—Dated June 16, 1868; reissue 3,482.—Eugene Sullivan (assignor to the American Horse Collar Company), Boston, Mass.
40,590.—Wrench.—Dated Nov. 10, 1863; reissue 3,483.—Loring Coes, Worcester, Mass., assignee, by mesne assignments, of George C. Taft.
12,215.—Harvester.—Dated Jan. 9, 1855; extended seven years; reissue 3,484.—Division 1.—J. F. Seiberling, Akron, Ohio, assignee of Fanny Holmes, executrix of the estate of J. E. Newcomb, deceased.
12,215.—Harvester Dropper.—Dated Jan. 9, 1855; extended seven years; reissue 3,485.—Division 2.—J. F. Seiberling, Akron, Ohio, assignee of Fanny Holmes, executrix of the estate of John E. Newcomb, deceased.

DESIGNS.

3,508.—Name Plate.—S. S. Bent, Port Chester, N. Y.
3,509, and 3,510.—Soda Fountain.—Edmund Bigelow, Springfield, Mass. Two Patents.
3,511.—Drawer Pull.—F. W. Brocksieper (assignor to Sargent and Company), New Haven, Conn.
3,512.—Black-Board Brush.—Daniel Carpenter, San Francisco, Cal.
3,513, and 3,514.—Floor Oil-Cloth Pattern.—Hugh Christie, Morrisania, N. Y. Two Patents.
3,515.—Ornamentation of Glass Ware.—Annie W. Henderson, Pittsburgh, Pa.
3,516.—Printer's Type.—Julius Herriot (assignor to D. W. Bruce), New York city.
3,517.—Statuette.—Otto Kornemann and Julius Jungbluth, New York city.
3,518.—Comb-Back.—G. T. Lincoln, Providence, R. I.
3,519.—Trade Mark.—Wm. Maddox, Ripley, Ohio.
3,520.—Clock Case.—G. B. Owen, Winsted, Conn.
3,521.—Trade Mark.—J. S. Pemberton, Atlanta, Ga.
3,522, and 3,523.—Car Bracket.—John Pratin, New York city, assignor to J. L. Howard and Company, Hartford, Conn. Two Patents.
3,524.—Floor Oil-Cloth Pattern.—Jos. Robley, Brooklyn, N. Y.
3,525, and 3,526.—Gentleman's Scarf.—Conrad Roder (assignor to himself, W. S. Weil, and Jacob Lowenstein), Philadelphia, Pa. Two Patents.
3,527.—Stocking Fabric.—C. H. Salmon (assignor to Thos. Dolan), Philadelphia, Pa.
3,528.—Plow.—Christopher Smith, Warsaw, Ind.
3,529.—Lamp Post.—H. B. Scholes, New York city.
3,530.—Sole of a Boot or Shoe.—Michael Thornton, Philadelphia, Pa.
3,531.—Trade Mark.—C. H. Warren, Toledo, Ohio.

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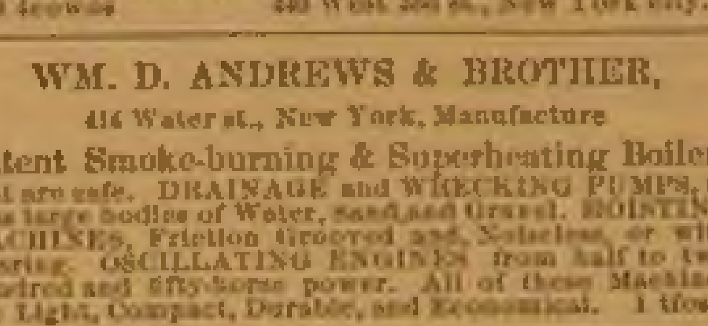

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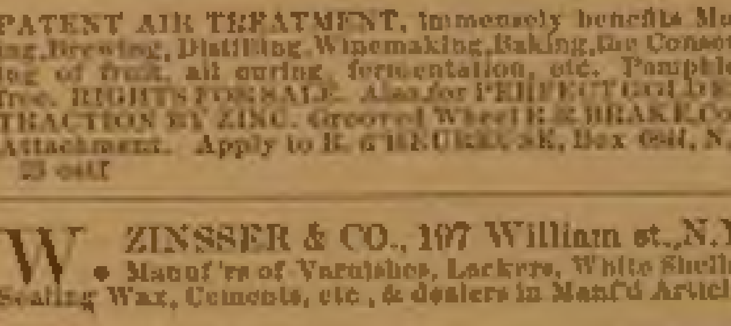

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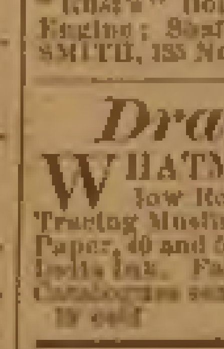

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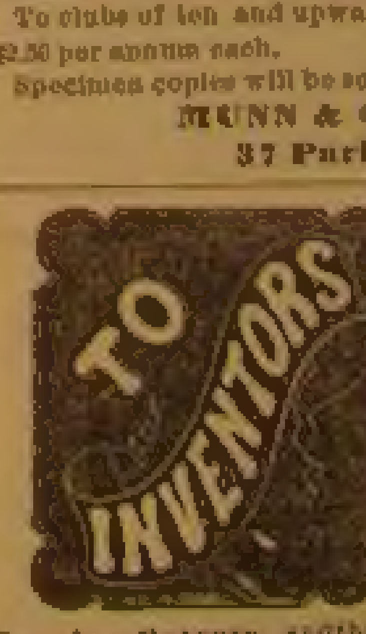

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